SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

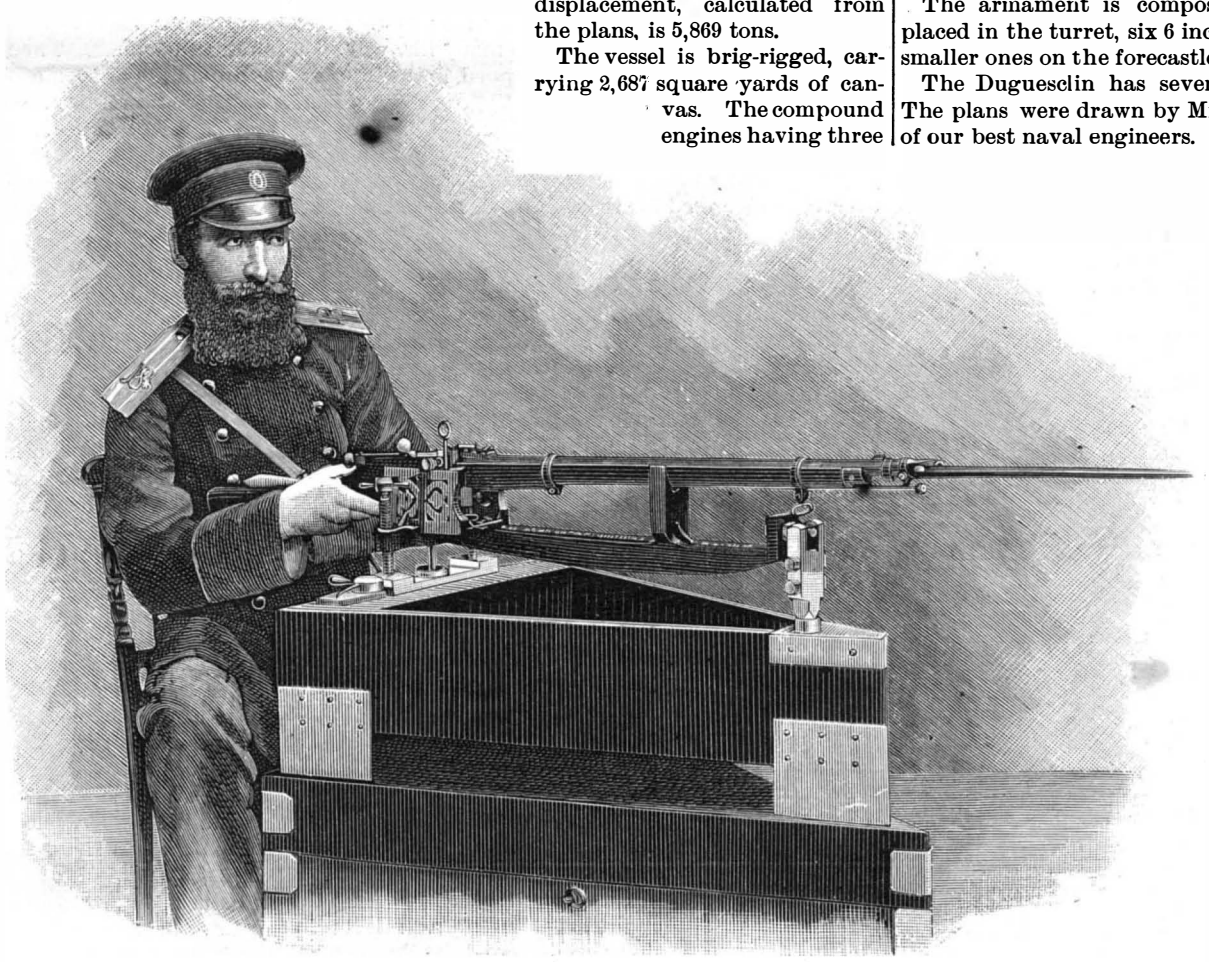
Vol. LIV.—No. 25. [NEW SERIES.] NEW YORK, JUNE 19, 1886. [$3.20 per Annum. [POSTAGE PREPAID.]

UNIVERSAL AIMING STAND.

The accompanying picture represents an illustration of an apparatus used in the Russian army for determining the ballistic qualities of military rifles. The test is usually made by crack-shot officers, who try every rifle separately, noting the result on a special printed graduated target. In such a manner the defects of every rifle are definitely ascertained, the ballistic inaccuracies and irregularities of deviation are defined, and the position of the movable sight is corrected.

Each soldier, in receiving his rifle, is also supplied with the record of its peculiarities, printed on a paper target, which serves him as a guide in his rifle practice, and greatly increases his efficiency in the field.

This apparatus was invented by Mr. Livchak, a Russian engineer. In the Russian army alone over 2,000 of these devices are now in use.—*Translated from Russian, the Univ. Illust.*



UNIVERSAL AIMING STAND.

THE DUGUESCLIN.

A NEW FRENCH IRONCLAD OF THE SECOND CLASS.

The new French ironclad of the second class Duguesclin lately left Rochefort for the high seas.

The Duguesclin is, we believe, the most powerful vessel that has been built at Rochefort. It measures 276 feet over all, 267 feet at the water line, and 57 feet beam. Its average draught is 23 feet, the draught at the stern being 25 feet, and the displacement, calculated from the plans, is 5,869 tons.

The vessel is brig-rigged, carrying 2,687 square yards of canvas. The compound engines having three vertical cylinders were made in the works at Indret. There are eight boilers, with sixteen fireplaces, and two propeller screws. The Duguesclin is protected by a belt of armor extending to the water line, and having a thickness of 10 inches amidships, 7 inches at the bow, and 6 inches at the stern; the armor on the turret is 8 inches thick, and on the bridge 2 inches.

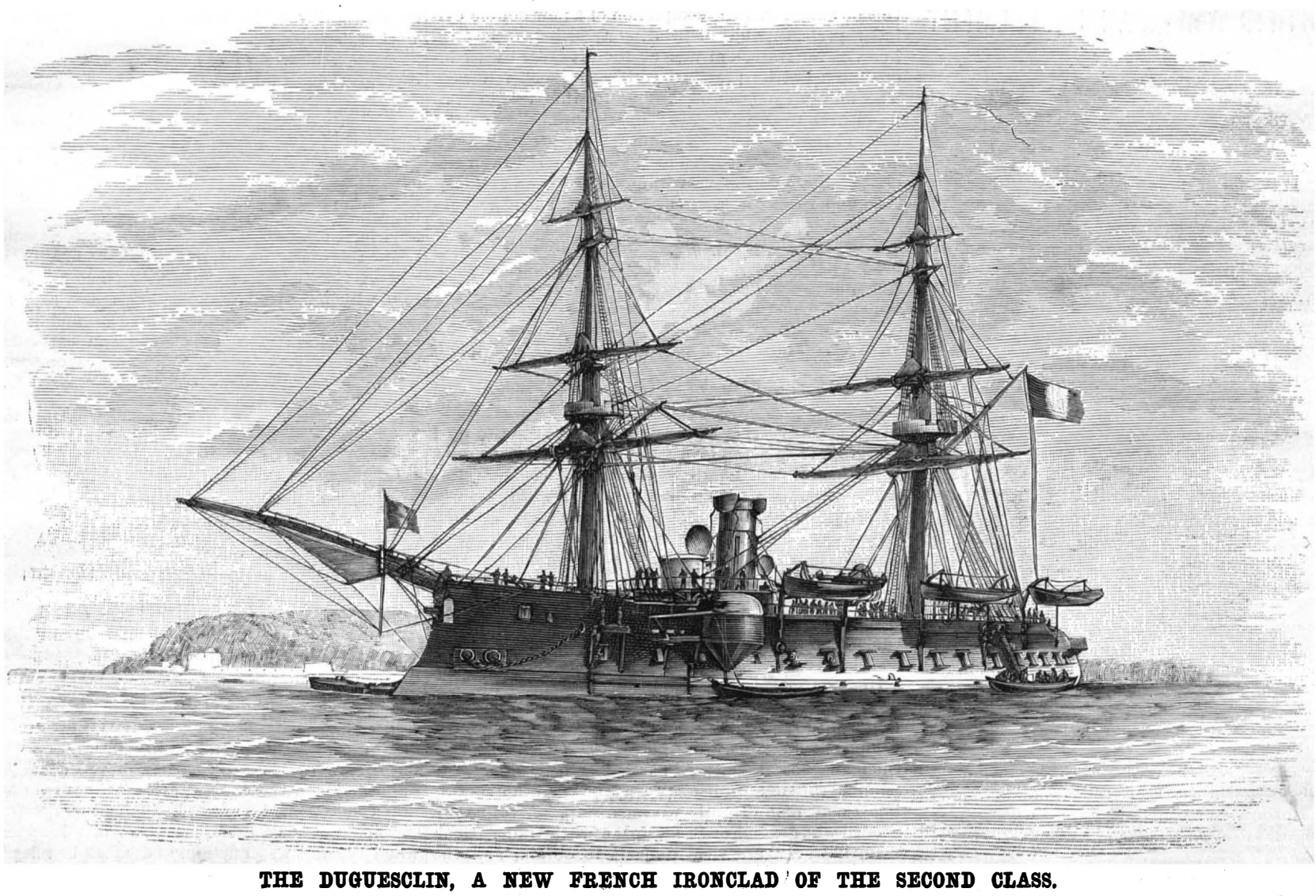
The armament is composed of four 10 inch guns placed in the turret, six 6 inch in the battery, and two smaller ones on the forecastle.

The Duguesclin has seven large, tight bulkheads. The plans were drawn by Mr Lebelin, of Dionne, one of our best naval engineers. A characteristic detail of this construction is that the armor rests on a bed of wood secured to the iron sides of the ship, and a sheathing of wood covered with copper extends a little above the water line over this armor.

The ironclad is bound for distant stations. Its construction cost, material and work, about $1,050,000. — *L'Illustration.*

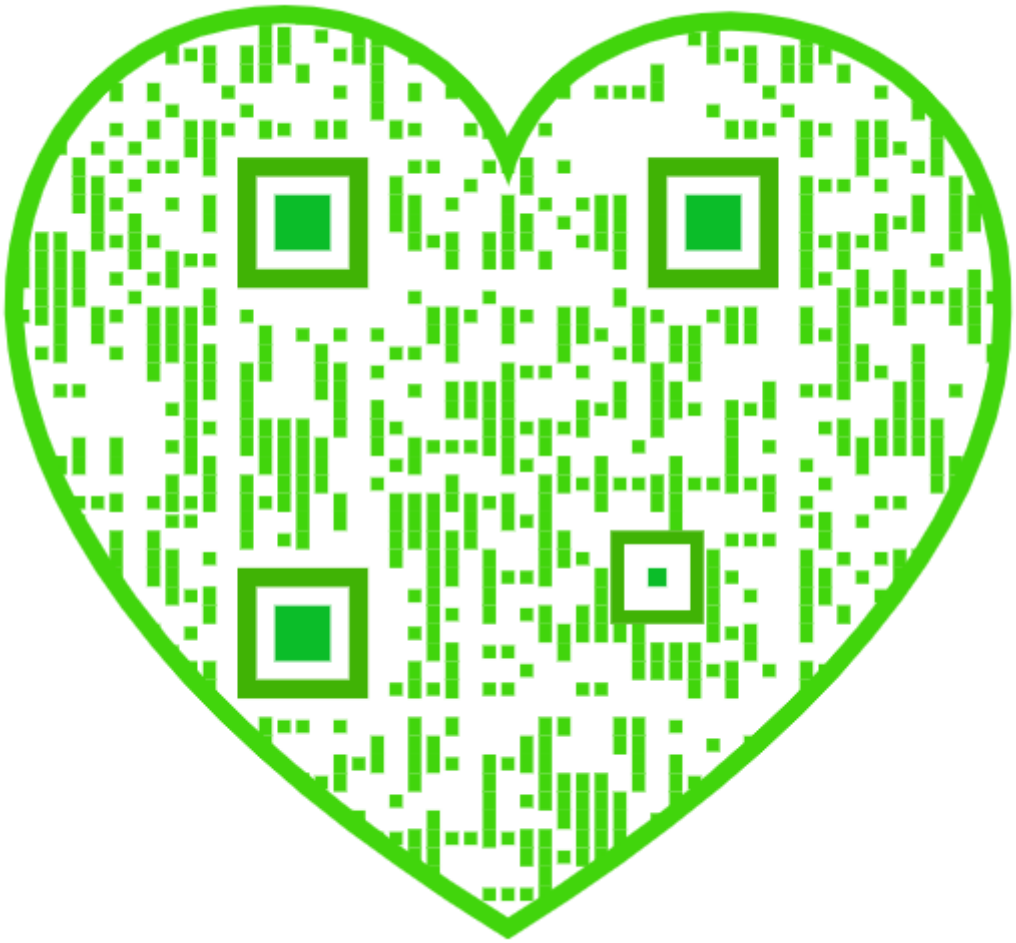
Grand Medal of Honor.

The Board of Judges appointed by the Franklin Institute, Philadelphia, after a thorough examination into the state of the art, has recommended that the grand medal of honor be awarded to Thaddeus S. C. Lowe, of Norristown, Pa., for his substantial improvements in the manufacture of water gas, and for his numerous improvements in methods and appliances for the utilization of water gas as a fuel for domestic and industrial purposes, and as an illuminating agent.



THE DUGUESCLIN, A NEW FRENCH IRONCLAD OF THE SECOND CLASS.

© 1886 SCIENTIFIC AMERICAN, INC



Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included..... $3 20
One copy, six months, postage included..... 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal or express money order. Address
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies, 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, JUNE 19, 1886.

Contents.

(Illustrated articles are marked with an asterisk.)

Aerolite hoax..... 384
Aiming stand, universal*..... 383
Birds in Japan*..... 393
Birds' nests in Japanese houses*. 393
Books and publications, new..... 394
Borax, test for..... 389
Bracket, shingling, Smerdon's*.. 386
Bulkhead doors, safety*..... 388
Business and personal..... 394
Cast iron beams..... 388
Cellar walls, damp, to cure..... 385
Chucking machine, vertical*..... 387
Colors, harmony of..... 389
Compartments, watertight, testing..... 388
Customers, unprofitable..... 388
Diphtheria..... 392
Dugueselin, the, a new French ironclad*..... 383
Dyeing apparatus, new*..... 390
Electricity, illuminating water by..... 393
Elevator, water, improved*..... 386
Engines, how they "kill"..... 392
Explosions, steam boiler, and their prevention..... 385
Farmer, the, not so bad for..... 389
Fishes, musical..... 387
Flooring clamp, improved*..... 386
Flying Dutchman, the..... 389
Fuel, determination of the calorific power of..... 387
Hoe, Col. Richard M., death of... 384
Horse detacher*..... 387
Horses of the world, the..... 390
Ironclad, French, new*..... 383
Inventions, engineering..... 394
Inventions, index of..... 395
Inventions, miscellaneous..... 394
Invention, new, reward offered 388
Lighthouse, Eddystone, at Liverpool..... 385
Locomotive, central power..... 388
Lycopodium, experiments with*. 393
Medal of honor, grand..... 383
Notes and queries..... 394, 395
Oil, albuminoid matter, and starch from corn..... 387
Oil, etc., removing by infusorial earth..... 386
Old age, the hygiene of..... 392
Ordnance supplies..... 391
Pasteur's work, summary of, latest..... 388
Patents, decisions relating to, recent..... 392
Petroleum in Denver..... 386
Photographic notes..... 385
Scarlet fever..... 391
Smoke, condensation of, by electricity..... 389
Steel, structure of..... 391
Stone, luminous..... 384
Telegraphy, African..... 389
Telegraphy, history of..... 389
Telephone decision, New Orleans 384
Track clearer, Bergendahl's*..... 386
Tunneling machine, sewer, improved*..... 390
Valve, governor, Walters'*..... 386
Vehicle platform gear*..... 387
Wash basins, etc., stationary, plug for*..... 386
Watt, James, workshop of*..... 391
Well, gas, drilling, cost of..... 391
Whooping cough, treatment of, with illuminating gas..... 392
Yellow fever, protection against.. 387
Zinc, durability of, when exposed to the atmosphere..... 384

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 546.

For the Week Ending June 19 1886.

Price 10 cents. For sale by all newsdealers.

PAGE

I. CHEMISTRY.—Recent Progress in Chemistry.—By Prof. H. CARRINGTON BOLTON.—A review read before the New York Academy of Sciences.—Chemical Societies; new elements: improved methods in spectrum analysis; atomic weights; correlation of atomic weights and properties of bodies; original form of matter; affinity and chemical action; electrolytic thermal chemistry; chemical dynamics, physics, and industries; liquefaction of gases; nomenclature; organic and sanitary chemistry, and tendencies of modern chemistry..... 8722
Fehling's Liquor as a Reagent..... 8726

II. ELECTRICITY AND MAGNETISM.—Earth Currents.—Dr. WEINSTEIN'S discussion of the subject before the Berlin Meteorological Society..... 8712
On the Use of Models for Instruction in the Magnetism of Iron.—An interesting description of an ingenious German model illustrating the deviations of the compass on board iron ships, and their correction.—Perspective view..... 8725
Pollak's Regenerating Pile.—2 illustrations..... 8725
Edison's New Telephone Apparatus.—A transmitter with metalliccontacts, for use with powerful current.—Mr. Bergmann's receiver.—4 illustrations..... 8726

III. ENGINEERING AND MECHANICS.—Sibley College Lectures. VIII. Principles involved in the construction of high speed engines.—By CHAS. T. PORTER.—An introductory review of the history of high speed engineering.—General principles of construction, bed plate, crank, and shaft.—Balancing.—Truth of construction and general conclusions.—7 figures..... 8715
A Watch without Hands.—A novelty brought out in Paris, by which the time is read directly.—2 illustrations..... 8719
A Wagon Wheel without Axle.—A description of M. Suc's novel wagon wheel and trundle.—The details of its construction.—3 illustrations..... 8719
Marine Engine Cranks and Shafts.—A flexible crank and propeller shafting in lieu of rigid shafting for marine propulsion.—A paper read by Mr. J. F. HALL before the Institution of Naval Architects, in which both systems are illustrated, and the merits of the flexible shaft pointed out.—21 figures..... 8719

IV. GEOLOGY AND EXPLORATION.—Yellowstone Park.—An interesting description of M. Tissandier's visit to the great national park.—Its mud volcanoes, geysers, and boiling springs.—6 illustrations..... 8711
A Project to Explore the Earth's Center.—A discussion of the plan proposed by Mr. J. J. Martinez, of the Argentine Republic, for investigating the constitution of the interior of the earth.—3 diagrams..... 8713

V. HYGIENE.—An Antiseptic Vessel.—Mr. Schribaux's invention for preventing fermentation in putrescible liquids.—1 illustration..... 8714

VI. PHOTOGRAPHY.—Reducing and Intensifying Negatives.—The red prussiate of potash method devised by Farmer.—The best manner of carrying it out.—Formulæ for the necessary baths..... 8714
Fouque's Photographic Seismograph.—A method of photographically recording seismic movements.—3 illustrations..... 8714

VII. PHYSICS.—Molecular Weight of Liquid Water..... 8726

VIII. TECHNOLOGY.—Algine.—Its preparation from seaweeds, and its application in dyeing..... 8712
Common Colors and Poisonous Colors.—Thomson's table of the common and chemical names, and composition of the colors used in the arts, and their physiological effects..... 8713

IX. ZOOLOGY.—Injury to Fish by Sewage and Waste Waters.—Effects of different chemicals and gases on fish..... 8713

THE NEW ORLEANS TELEPHONE DECISION.

This case has been decided in favor of the Bell Telephone Company by Judges Dan A. Pardee and Edward C. Billings. The argument by Mr. J. R. Beckwith, in opposition to the injunction motion, was quite a novelty in its way. It was accompanied by the exhibition of a number of experiments in the court room on the quality of sound, rapid circuit breaking, and other points. Twenty-one days was the duration of the argument and presentation of evidence in the motion. Much was hoped from this suit by the opponents of the Bell patents, but the judges decide strongly in Bell's favor. The operativeness of the 1876 patent as a speaking telephone, and of Reis' inventions, is considered in the decision. The hopes of a different result were founded on the fact that the case was heard in the South, away from the circuits where the patent has been so often sustained. Meanwhile, one point must not be overlooked. The Bell patent has only seven years to run. Time, that cures so many ills, will soon remedy this one. But it is to be hoped, in the interests of abstract justice, that the case will go to the Supreme Court, and be heard on its merits there. The Government suit may decide the patent invalid, but the prospects can hardly be called as favorable for that issue as they were esteemed for the chances of the New Orleans suit, that has gone the other way.

THE DEATH OF COL. RICHARD M. HOE.

Col. Richard M. Hoe died suddenly of heart disease at Florence, Italy, on the 9th of June. He was born in New York, September 12, 1812, and was consequently in his 74th year.

There are few names in the long list of American inventors which are more distinguished than that of Col. Hoe. The history of his life and work is the history of the perfection of the printing press. Col. Hoe's father was an Englishman, and came to this country in the early part of the century. In connection with Mr. Peter Smith, the inventor, he engaged in the manufacture of hand presses, and soon established one of the most important enterprises of the kind in this country. The son inherited his father's inventive genius, and from his earliest boyhood took a deep interest in all the details of press construction.

At the early age of twenty he became the head of the firm, the father's failing health having compelled his retirement.

The possibility of printing by steam was under discussion at this time, and nowhere received more thoughtful attention than from the young inventor. It was his good fortune to be called upon to set up the first Napier press brought to this country. His careful study of its construction, supplemented by the personal investigations of his partner in England, enabled him to devise an improved press, which rapidly superseded all others in the market.

In 1837 Col. Hoe invented a valuable method of manufacturing circular saws, which was widely adopted, both in this country and Great Britain. Soon after this he announced the completion of a new double cylinder press, capable of printing 6,000 impressions an hour. The statement was at first regarded with incredulity, but its practical verification soon followed. The first press built according to this design was purchased by Mr. Moses Y. Beach, publisher, at the time, of the New York *Sun*, and was long regarded as a marvel of progress. Even in those days, however, the metropolitan dailies were rapidly growing in circulation, and there was soon a strong demand for more rapid work.

From 1841 to 1846, Colonel Hoe labored in vain to meet this demand. And he was finally successful. The plan of fixing the type on a horizontal cylinder occurred to him, and was at once carried out in a four cylinder press, capable of printing 10,000 copies an hour. This invention brought further wealth and honor to its author, for it was introduced in many of the leading publishing houses in this country as well as abroad. The capacity of the press was increased from year to year, until at last ten cylinders were used and from twenty to twenty-five thousand impressions turned off in an hour. Such a mechanism, however, possessed a number of disadvantages. Its first cost was fifty thousand dollars, and as the services of one man were required for each cylinder, the expense of operation was also large. It was, moreover, rather a cumbrous affair, being 40 feet long, 15 feet wide, and 16 feet high. These disadvantages eventually led to the invention of the web presses now in use, which cut the paper after both sides have been printed, fold it, and deliver a perfect newspaper.

Under Colonel Hoe's judicious management, the business of the firm has grown to enormous proportions, until it is to-day a representative of the best development in American industries. One feature of the management deserves particular attention. The manufacture of a printing press is an operation requiring exact and careful workmanship. Artisans are needed who are thorough masters of their trade. Such men, however, are very difficult to obtain, and the firm has found it necessary to educate their own workmen. They have now between two and three hundred boys in their establishment, who have been very carefully selected, and who are being trained in a practical, sensible manner to occupy trusted positions in the works.

During the day the boys are engaged in the shops, but in the evening they attend a well equipped school, maintained at the expense of the firm. The attendance is made compulsory, but all possible freedom is afforded the pupils in the selection of their special branches of study. The boys' natural tastes are consulted with as much care as they are afterward developed. The hours are made short, in order not to overtask the pupils. As time would not permit the majority of them to go home for supper, a plain, wholesome meal is provided for them in the neighborhood. In this manner good health and prompt attendance are secured. The system has worked well for both the firm and the workmen. The relations between the two are on the friendly basis which secures immunity from change and disturbances. The men are well treated and sure of promotion as soon as they are competent, and as a result the firm is well served. The wonderful growth and success of the firm are largely due to the careful workmanship which such a course has made possible.

Luminous Stone.

A method of utilizing the luminous powder prepared mainly as a sulphide of calcium for admixture with cements, plaster of Paris, and concrete has been recently invented by E. Ormerod and W. C. Horne, of London, the object being to prepare the articles with a self-contained phosphorescent property instead of coating them with luminous paint. As an example, the patentees take of cement, such as is known as Keen's Parian or other suitable make, in varying proportions, as, for instance, 2 pounds to 5 pounds to 1 pound of the luminous powder; mix the same with water, and then mould it to required shape in the usual way, or lay it on to ceilings or walls by means of a trowel. The patentees attach importance to placing the moulded articles, as soon as they have been dried, in a bath of paraffine wax and benzoline or other suitable weather or water proofing substance. In the case of using the luminous cement upon a wall or ceiling, they sponge or brush the surface over with a solution of paraffine wax and benzoline or other suitable dampproofing solution. The uses of a luminous cement are manifold: *E. g.*, for the garden—luminous concrete as edging to garden paths and carriage drives, for guides and beacons at the entrance gates of drives, insides of stables, the base of balustrades, or the entirety of balustrades. For roads—as luminous beacons at corners of dark country lanes, and at the ends of bridges, ends of walls, and curbs of footpaths. For docks—for edging of piers and wharves. For waterworks—for the safety and dispatch of night work by the erection of luminous guides and beacons and for fire plug notices on walls. In short, for any places where the light of day will sufficiently excite the phosphorescent property as to render the cement or concrete work luminous by night.

Durability of Zinc when Exposed to the Atmosphere.

Dr. John Percy, who is a very high authority, on page 531 of his book on Metallurgy, published by John Murray, of London, in 1861, writes as follows: "At the ordinary temperature, zinc is not acted upon by dry oxygen; but when exposed to moist oxygen or to atmospheric air, its surface acquires a compact, tenacious, gray coating of hydrated oxide, which impedes the oxidation of the subjacent metal. In this respect the rust of zinc differs much from the rust of iron, which, instead of impeding, seems rather to accelerate the oxidation of the subjacent metal. By the conjoint action of moist oxygen and carbonic acid, zinc is converted into a hydrated carbonate. The roofing from which the specimen analyzed was obtained had been exposed to the atmosphere of Munich for 27 years. Pettenkofer ascertained that during that period 8·381 grammes of zinc per square foot (Bavarian) had been oxidized, and that nearly half of the oxide is carried off by rain. Hence he estimated that a layer of zinc only 0·005 of a line (a line is one-twelfth of an inch) in thickness requires, in the atmosphere of Munich, 27 years to be entirely corroded; so that, leaving out of consideration the oxidation of the lower surface, which may be practically disregarded, a zinc roof of one-quarter of a line (equal to one forty-eighth of an inch) in thickness would be completely corroded in 1,243 years.

An Aerolite Hoax.

In our issue of May 29 we gave an account of the finding of a great meteorite in Washington County, Pa. We were indebted for the story to a daily paper published near the locality, and after our efforts to obtain a more direct account had failed, we accepted the statement of our contemporary as true. It appears the whole account was a fiction, and must be relegated to the same shelf with the famous moon hoax of the New York *Sun*.

© 1886 SCIENTIFIC AMERICAN, INC

PHOTOGRAPHIC NOTES.

Glazing Gelatino-Bromide Prints.—The use of highly hand-polished sheet vulcanite rubber for imparting a high gloss to the surface of gelatino-bromide prints is now well known, but, in consequence of the difficulty in obtaining good samples, and of its high cost, the general use of it has been somewhat limited. A substitute, in the shape of ferrotype plates, costing but a mere fraction of the rubber, has been recently tried with success. Upon the smooth varnished side of the sheet is laid the moist print, film side down. It is then squeegeed by passing a rubber roller over the back, which presses out all the air bells. In an hour or so the print, when dry, can be pulled off at one corner, and will possess a high gloss.

A slight heat applied on the rough side of the metal sheet will materially hasten the drying.

Portable Apparatus for Generating Oxygen Gas.—Prof. L. H. Laudy, of Columbia College, New York, exhibited before the New York Society of Amateur Photographers, on the 8th inst., an improved apparatus for generating oxygen gas, designed as a substitute for oxygen gas bags and cylinders, and showed how applicable it was for the use of amateurs in producing a powerful lime light for the optical lantern.

The blow through jet was used; the ordinary street gas, taken from the gas fixture, furnishing the hydrogen. The oxygen mixture of chlorate of potash and manganese was held in a metal tube of tin, 2 feet long by 2 inches in diameter, supported in a horizontal position on a light stand, about 8 inches above the base. A special improvement in these cylinders, invented by Prof. Laudy, consisted in having a removable metal conical-shaped brass plug at one end, which was held in place, after being driven in by a slight tap of the hammer, by the compression of the end of the tube. The object of the plug was to permit the materials to be easily discharged from the tube after the oxygen had been exhausted, then to be refilled again with fresh potash and manganese.

To produce the gas, it was only necessary to heat the tube with a Bunsen burner, commencing at one end and gradually sliding it along on the base under the tube at intervals until the oxygen was exhausted from the chemicals. Leading from the oxygen tube was a rubber pipe, which communicated with a copper gas holder, 18 inches in diameter by about the same depth.

The upper cup fitted into a similar inverted bottom cup, having a deep annular recess, which held about three quarts of water, the latter acting as a seal. The whole was supported in a light wood frame.

An improvement devised by Prof. Laudy consisted in making a square tube (¼ inch square), extending from the top of the upper gas cup, act as a guide to the upward or downward movement of the holder. On the upper portion of the wood frame was a metal sleeve, through which the exit square guide tube passed. From the upper end of the latter extended a flexible tube to the burner. A weight placed on the upper cup of the gas holder gave a uniform pressure to the gas.

To start the apparatus, the Bunsen burner was lighted and placed under one end of the oxygen tube; as the gas was generated, the upper cup of the holder filled and ascended, similar to the action of a gasometer.

When half elevated, the lime light burner was lighted, and in a short time a brilliant light was produced, perfectly noiseless, steady, and estimated to be equal in intensity to 125 candles.

One tube of the mixture would supply sufficient gas for an hour's exhibition.

The advantages were that it was noiseless, non-explosive, absolutely safe, and could be made ready for use at short notice.

It was explained that a practical apparatus for producing oxygen from tubes where the gas was burned as fast as generated was invented as long ago as 1870. A lantern slide of the apparatus was thrown on the screen.

The estimated cost of operating a lime light with Prof. Laudy's apparatus was but twelve cents an hour, and its simplicity made it well adapted for use in parlor or lecture exhibitions, where a good, soft, strong light is oftentimes required, without delay and trouble.

The Eddystone Lighthouse at Liverpool.

One of the most attractive and novel features of the Liverpool Exhibition, lately opened by the Queen, will be the full size representation of the New Eddystone Lighthouse, now being erected in the grounds. Externally, the structure will be an exact representation of the original, every detail, even to the courses of the stones, being faithfully reproduced. The height from the ground line, or bottom of base, to the center of the light is 150 ft., and the total height to the top of the lantern roof is 170 ft. As the base of the structure is nearly 150 ft. above the level of the quay wall at the landing stage, the height of the light will be about 300 ft. above the sea level. The diameter of the base—which has a vertical face of 20 ft. high—is 44 ft. The diameter of the structure, starting from the top of the base, is 35 ft. 6 in., and this gradually tapers to a diameter of 19 ft. near the top of the main structure, to receive the lantern.

This lantern is 14 ft. diameter inside, thus leaving a width of 5 ft. outside for a gallery. The height of the lantern is 16 ft. 6 in. to the eaves of the roof, 12 ft. 6 in. of which is glazed with diagonal "squares," rolled and cut to the exact shape and size. Beginning at the bottom of the tower, 36 strong foundation bolts are secured to heavy anchor plates, buried 20 ft. below the surface of the ground, and on massive blocks of cement concrete are fixed the base plates of the main ribs, the foundation work being done by Mr. Henshaw, of Chatham Street. There are six of these main ribs, and a space of 9 ft. is left in the center, forming a shaft in which will work the passenger lift. The ribs are constructed of wrought-iron rolled beams, tee bars, angle irons, and flat bars, braced together, dividing each rib vertically into thirteen bays, the level of each bay corresponding to a floor line in the original lighthouse. The ironwork has been constructed at the works of Messrs Timmins & Pirrie. The iron framework will first be covered with a wooden framework, spaced 18 in. apart, by Messrs. Brown & Backhouse; this framework will be covered by cement plaster slabs. The lift is being made by Messrs. Waygood, of Liverpool and London. The cage will be hexagonal in shape, 8 ft. across, and about 9 ft. high; it will be made of polished walnut, and fitted with beveled mirrors and ornamental lead lights.

The lighthouse will be illuminated at night by a powerful revolving light, having an electric lamp and lenses of the fourth order, this work being supplied by Messrs. Chance Bros., of Birmingham. To prevent accidents, the balcony will be protected by a strong wire network cage. There will be over one hundred tons of ironwork in the structure, made up of over 4,000 pieces of iron. The engineer for the work is Mr. John J. Webster, Assoc.M.Inst.C.E., of Stephenson chambers, Lord Street, under whose superintendence the work is being carried out.—*Building News.*

Steam Boiler Explosions and Their Prevention.

In the *Rivista Scientifica Industriale Italiana* we read that Prof. Giovanni Luvini has presented to the Societe des Ingenieurs et Industriels of Turin an important memoir upon the explosion of steam boilers, and upon the means of preventing them by facilitating the boiling of the liquid. The author particularly examines explosions due to superheating of water—the only ones that are ever unavoidable, even by continual care and attention.

As well known, when a liquid at rest is slowly heated its temperature will often rise above its boiling point. A superheated liquid is thus obtained whose temperature rises above the boiling point.

Superheated water contains within it a quantity of heat that is capable of serving to volatilize it, and, if any cause whatever (such as a shock, some part of the boiler getting hotter than others, the entrance of an air bubble into the water, or the introduction of substances that favor ebullition) puts an end to the conditions to which the superheating is due, a part of the water will abruptly evaporate at the expense of the heat that it contains in excess, and there will occur a sort of explosion, whose energy will depend upon the difference between the temperature of the superheated water and its minimum temperature of ebullition.

When such difference is considerable, the quantity of steam formed, and its pressure, may become great enough to burst any boiler whatever.

It results from the experiments of all the physicists who have studied the subject, and particularly from those of Bellani and Donny, that water free from air cannot boil at any temperature, and that, pressure being equal, the temperature of ebullition becomes so much the higher in proportion as the water contains less air.

Prof. Luvini repeated most of Bellani's and Gernez's experiments for the purpose of finding a remedy against the explosion of boilers through superheating, and studied the influence on ebullition of the size and form of a tube, closed at one end (of either glass or metal), introduced into the water. He found (1) that the effect produced depends in nowise upon the material used, but upon the contained air; (2) that the larger the tube or vessel, the larger and fewer are the bubbles of air that form in the steam; (3) that if the internal empty space in the tube or vessel terminates in a tapering point, the tube's property of facilitating ebullition appears indefinite, while if it be rounded its action ceases in a few hours; (4) that a bundle of small glass tubes, with their apertures pointing downward, and placed in a glass flask containing boiling water, gives rise to an abundant production of steam—a result that may likewise be reached through a horizontal brass, copper, or iron cylinder provided beneath with a large number of small conical holes, a millimeter or two in diameter; and (5) that if water be heated in a flask, provided with a thermometer, we shall sometimes see the latter indicate 104° to 105° C. before the water begins to boil in large bubbles; and when the metal cylinder is introduced, the ebullition will at once become brisk and regular, and the temperature of the water will immediately fall a few degrees.

Now, the question is to know for how long a time these glass tubes or metallic cylinders can produce the effect described. Prof. Luvini's predecessors in this field of research operated with glass only, and considered the space of time indefinite, although their experiments did not last over 24 hours.

Prof. Luvini performed one experiment that lasted 82 hours, during which the water boiled 53 hours—9 the first day, 14½ the two following days, and 15 on the last. When the cylinder was put into water on the first day, the boiling was proceeding slowly, and was accompanied with large bubbles, and the thermometer marked 105°. After the introduction of the cylinder, the ebullition became regular, and the temperature fell promptly to 100°, and stood during the hour of ebullition between 99·3° and 100·5°. During this time the barometric pressure fell from 739·7 mm. to 734·1 mm. After the cylinder was removed, the temperature soon rose to 102°.

This same experiment was repeated with two flasks—one of them provided with a cylinder, and the other not. In the first twelve days the temperature of the first rose from 100·5° to 101·2°, and that of the second from 101° to 104°, and the pressure from 739·1 mm. to 750·5 mm. At the end of the twelfth day, the water of the first flask began to boil with great vigor, like that of the second, and at the beginning of the thirteenth day the cylinder had ceased to act.

The water employed in all these experiments was potable and yielded much deposit, which, when the water was boiled in the flask for two or three days without the cylinder, adhered firmly to the glass, and formed a scale that could not be detached by simple washing; while, on the contrary, when the water was boiled in the presence of the metallic cylinder, what deposit occurred was in the form of a loose powder upon the bottom of the vessel.

For the purpose of ascertaining whether water produces a larger quantity of steam when it boils vigorously and at a high temperature, Prof. Luvini performed the following experiment: While keeping the gas flame constant under the flask, he weighed the boiling water, and then continued the ebullition for 10, 20, or 30 minutes, alternately with and without the metallic cylinder, and taking the weight each time.

Upon repeating this operation several times, he found that, within the limits of probable errors as to the equality in time, the same quantity of water is consumed in each case. The only difference is that, with the cylinder, the vaporization is complete, and that without it there is carried along much water, which evaporates in the air.

So Prof. Luvini proposes a new apparatus, and one which is simple, efficacious, and cheap, which can be applied to any steam generator, old or new—an apparatus which does not require a mechanic to apply it, and which is an absolute preventive of the explosion of boilers by superheating, by its rendering the development of steam more regular.

This apparatus consists of a small metallic frame, called a vaporizer. It may be made of any kind of metal, may be of any form, and is applicable to any sort of boiler. The lower surface of the vaporizer is provided with cavities of a suitable form. Four vertical legs hold it at a distance of one or two centimeters (four-tenths or eight-tenths inch) from the bottom of the boiler. These cavities imprison air during the descent of the vaporizer, and act after the manner of the small tubes used by Prof. Luvini in his experiments. The upper surface is provided with a ring, with which the apparatus may be handled.

Prof. Luvini's experiments show that this vaporizer is capable of protecting a boiler for from ten to twelve days without a renewal of the air contained in the apertures. By taking it out and putting it back, then, once a week, we can be secured against any danger of explosion due to superheating.*

It is to be noted, further, that the vaporizer secures a saving in fuel, for three reasons: (1) because, through the presence of the air in the apparatus, the water boils at a lower temperature than it otherwise would; (2) because, as a consequence, the difference between the temperature of the boiler and that of the surrounding air is less, and consequently the loss of heat through contact and radiation is likewise less; and (3) because, since the vaporizer does not allow of a turbulent ebullition, there is no water carried along.—*Chronique Industrielle.*

To Cure Damp Cellar Walls.

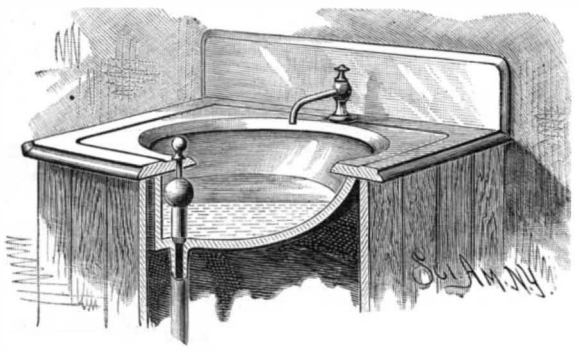
The following, it is said, will accomplish an admirable result: Boil two ounces of grease with two quarts of tar for nearly twenty minutes in an iron vessel, and having ready pounded glass one pound, slaked lime two pounds, well dried in an iron pot, and sifted through a flour sieve. Add some of the lime to the tar and glass, to form a thin paste only sufficient to cover a square foot at a time, about an eighth of an inch thick.

* It would seem that blowing out the boiler would measurably answer the same purpose.—ED.

© 1886 SCIENTIFIC AMERICAN, INC

PLUG FOR STATIONARY WASH BASINS, ETC.

The outlet of the basin is at the lowest point, and is preferably in the front portion of the bottom. The plug is a buoyant one, and automatically rises to uncover the outlet when the water in the basin reaches a certain height. The lower end of the plug is conical, and is ground to closely fit the opening without binding. The plug, after rising by its buoyancy, to pass off an excessive quantity of water, closes by its own weight



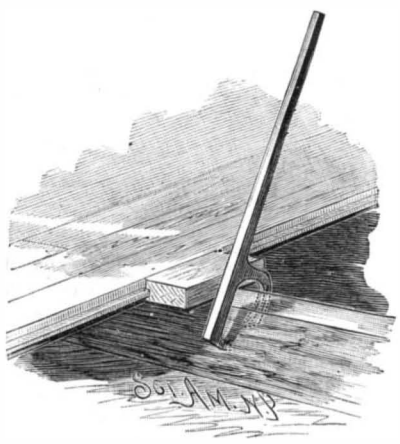
REID'S PLUG FOR STATIONARY WASH BASINS, ETC.

as the water lowers in the basin. To empty the bowl for use, the plug is raised by hand, by grasping the knob. This plug is an automatic seal, preventing the admission of noxious gases into and through the basin, and an effective waste and automatic overflow device combined. It is little liable to get out of order, and can easily be kept clean.

This invention has been patented by Mr. James W. Reid, of Evansville, Ind.

IMPROVED FLOORING CLAMP.

The lever is made of iron or steel, and at the end is formed with a point projecting laterally slightly beyond the end of the lever. On the side of the lever is a curved arm having a point directed toward the body

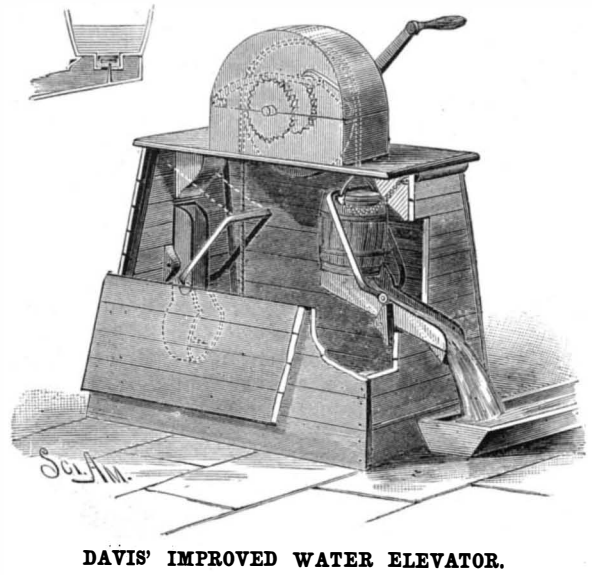


McRAE'S IMPROVED FLOORING CLAMP.

of the lever. The space between the points is sufficient to admit of placing the lever on a joist with the points on the opposite sides, as shown in the cut. By pushing the arm of the lever forward against the edge of the flooring or ceiling, or against a block placed on the edge of the strip of flooring, the latter can be forced into position and held while being nailed. This clamp, the invention of Mr. John B. McRae, of Mount Holly, Ark., can be quickly applied and removed, and can be made small and light, so as to be readily portable.

IMPROVED WATER ELEVATOR.

In this device two buckets are preferably employed, one on each end of a rope passing over a pulley, on a shaft journaled in the top of a casing of ordinary con-



DAVIS' IMPROVED WATER ELEVATOR.

struction. This shaft is operated by a crank, and is provided with two ratchet disks having teeth facing in opposite directions. Pawls united by a link, so that while one is in operation the other will be disengaged, engage with the disks. The spout is pivoted to the framing, and to its inner part are pivoted the ends of a bail, whose arms are spread laterally toward their upper ends. This spreading provides a sufficient space for the upper end of the bucket, so that the latter will properly engage the cross bar of the bail. The upper end of the bail is connected with the casing by a chain, as shown. When taut, this chain holds the bail in position to be engaged by the bucket. A bracket, secured to the upper part of the framing, serves as a stop for the upper end of the bail, and as a means for steadying the bucket as the water is being discharged.

The inner end of the trough is provided with a projection, by which to open the valve in the bottom of the bucket, or the valve may have a depending stem, by which to engage the trough and be tripped. The outer end of the trough is weighted, so as to insure that the inner end will be thrown up with sufficient force to open the valve. The rising bucket engages with the bail when the inner end of the trough rises up under the bucket, lifts the valve, and allows the water to run out. When the bucket descends, the weight of the bail is sufficient to bring the trough to a vertical position, and the device is ready to be again operated.

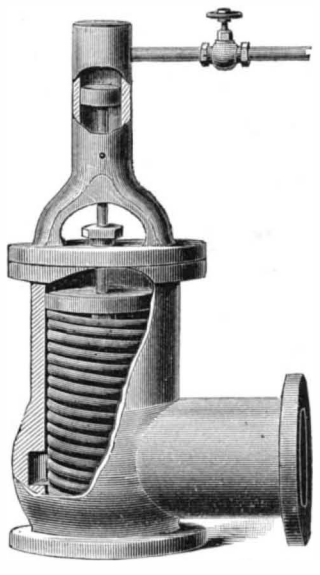
This invention has been patented by Mr. J. C. Davis, of Athens, Ga.

Removing Oil, etc., by Infusorial Earth.

Scouring or removing oil from substances such as wool and woolen cloth, by means of infusorial earth, is claimed as an improvement by Groth. This kind of earth is one that absorbs a great quantity of liquid, and is what is used to absorb nitro-glycerine and make it into dynamite. The patentee states that it is this extraordinary power of taking up liquids which enables it to withdraw oil from textiles containing it. The process is to warm the textile with the infusorial earth in some apparatus where the temperature may exceed by 10 or 20 degrees the melting point of the oil or grease. As soon as it is liquefied, the infusorial earth takes it up from the textile. After this the materials are passed through warm water, which washes off the infusorial earth, leaving the fiber clean. If, instead of infusorial earth, we read fuller's earth, the principle of the process will be found very ancient.

GOVERNOR VALVE.

The object of the invention herewith illustrated is to provide for steam engine governors and steam pressure regulators a simple and reliable balance valve for controlling the flow of steam. In one side of the cylindrical casing is a branch pipe communicating with an annular recess within the casing. Within the casing is a loosely fitted piston, resting upon a spiral spring supported upon a fillet formed in the lower end of the



WALTERS' GOVERNOR VALVE.

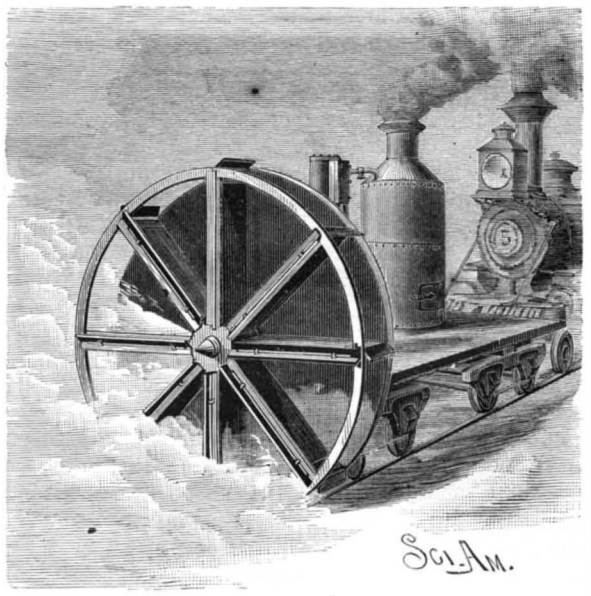
casing. The piston rod passes through a gland in the cap and enters a small steam cylinder, where it is attached to a piston fitting steam tight. In the upper end of this cylinder is inserted a steam supply pipe for furnishing steam from the pipe which is supplied with steam through the valve casing. In the lower end of this cylinder is a small aperture for maintaining atmospheric pressure under the piston. Steam may enter the casing through the bottom opening or through the branch pipe, and in its passage must necessarily pass between the different convolutions of the spring. When the upper piston is forced downward by increased pressure, the spring is contracted and the area of the passage through the valve is diminished until the pressure in the supply pipe has reached the prescribed limit. Should this pressure become too greatly reduced, the spring will expand, and by increasing the area of the passage, allow more steam to flow through. When this device is used in connection with an automatic engine governor, the spring is operated directly by the valve-operating spindle of the governor.

This invention has been patented by Mr. James P. Walters, of Rosedale, Ind.

TRACK CLEARER.

This machine, for clearing railway tracks of snow, consists of a wheel carrying radial plates, provided on the ends and forward edges with reversible cutters, to admit of revolving the wheel in either direction. Upon the forward end of a shaft journaled in bearings carried by a flat car, propelled by a locomotive, are mounted a disk and spider having radial arms.

The disk and arms are grooved radially to receive plates, which fill the space between the arms and disk. At the outer edge of each plate is pivoted a two-edged cutter. By means of a lever these cutters can be turned so as to bring either edge into position for use. To the front surface of each spider arm is also pivoted a two-edge cutter, either edge of which can be brought into service. The shaft is driven by gearing operated by an engine carried by the car. As the wheel is rotated, the snow taken up by the knives is received into the triangular compartments in the wheel and thrown out-



BERGENDAHL'S TRACK CLEARER.

ward by centrifugal force, the impetus being sufficient to carry it out of the vicinity of the track. Where the track is built on a mountain side, the wheel can be made to revolve so as to project the snow from the open side of the track.

This invention has been patented by Mr. L. J. Bergendahl, whose address is lock box 55, Pendleton, Oregon.

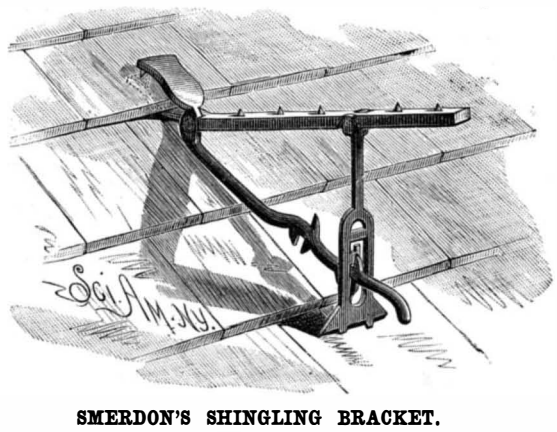
Petroleum in Denver.

While sinking an artesian well on the premises of Ex-Governor Evans, in the heart of Denver, petroleum was struck at a depth of 1,100 feet. Oil men from Pennsylvania are disposed to believe that the prospects are good for an abundant flow. The well will probably be sunk several hundred feet deeper.

SHINGLING BRACKET.

The accompanying engraving clearly shows a shingling bracket, recently patented by Mr. William H. Smerdon, of Taunton, Mass. The shorter arms of the two levers, which are pivoted together, are provided with spurs. The arm of the upper or horizontal lever is passed under a shingle, when its two spurs enter the upper and lower shingle, the spur of the other arm entering the opposite surface of the clasped shingle. An upright, forked at its upper end, is pivoted to the long arm of the horizontal lever, and is formed at its lower end with a wide chisel edge, having two or more spurs that engage with the finished roof.

Above the chisel edge the upright is widened and formed with an oblong aperture, having on one edge L-shaped lugs, with which engage lugs on the lower portion of the inclined lever. To apply this bracket, the short arms are made to clasp the shingle, when the lower portion of the inclined lever is raised, and the proper lugs are brought into engagement to hold the parts in their relative positions. The boards to form the staging are then placed on the horizontal lever, the



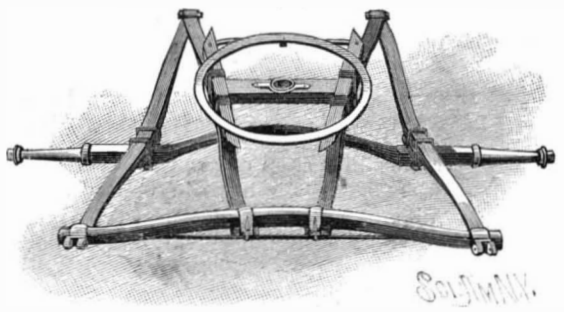
SMERDON'S SHINGLING BRACKET.

spurs on the upper edge of which hold them securely. The spurs on the chisel edge prevent the upright from slipping.

© 1886 SCIENTIFIC AMERICAN, INC

VEHICLE PLATFORM GEAR.

The side springs are secured to the axle in the ordinary manner by clips, and the ends of their main leaves are formed with eyes which rest within longitudinally slotted tubes. The central springs are also formed with eyes, which fit snugly within the forward tube, the ends of the spring being placed toward the center of the bar. The rear eyes are large enough to be slipped over the rear eyes of the side springs, the tube in this case being slipped over the eyes of both sets of springs. Rods passed through the tubes and eyes afford an additional support for the springs, and serve to strengthen the tubes which constitute the front and rear bars of the platform. The shaft clips are secured directly to the forward bar. The ends of the springs are clamped in place by clips. The frame constituting the bed of the fifth wheel is held to the two center springs. The rear tube may be entirely dispensed with, the overlapping ends of the springs being united by bolts, as shown in the cut,



HOLMAN'S VEHICLE PLATFORM GEAR.

and for the forward tube may be substituted a wooden bar strengthened by an iron rod. This construction is particularly well adapted for all except very heavy wagons. This peculiar W formation of the platform prevents it from getting out of square, as each spring serves as a brace for the others.

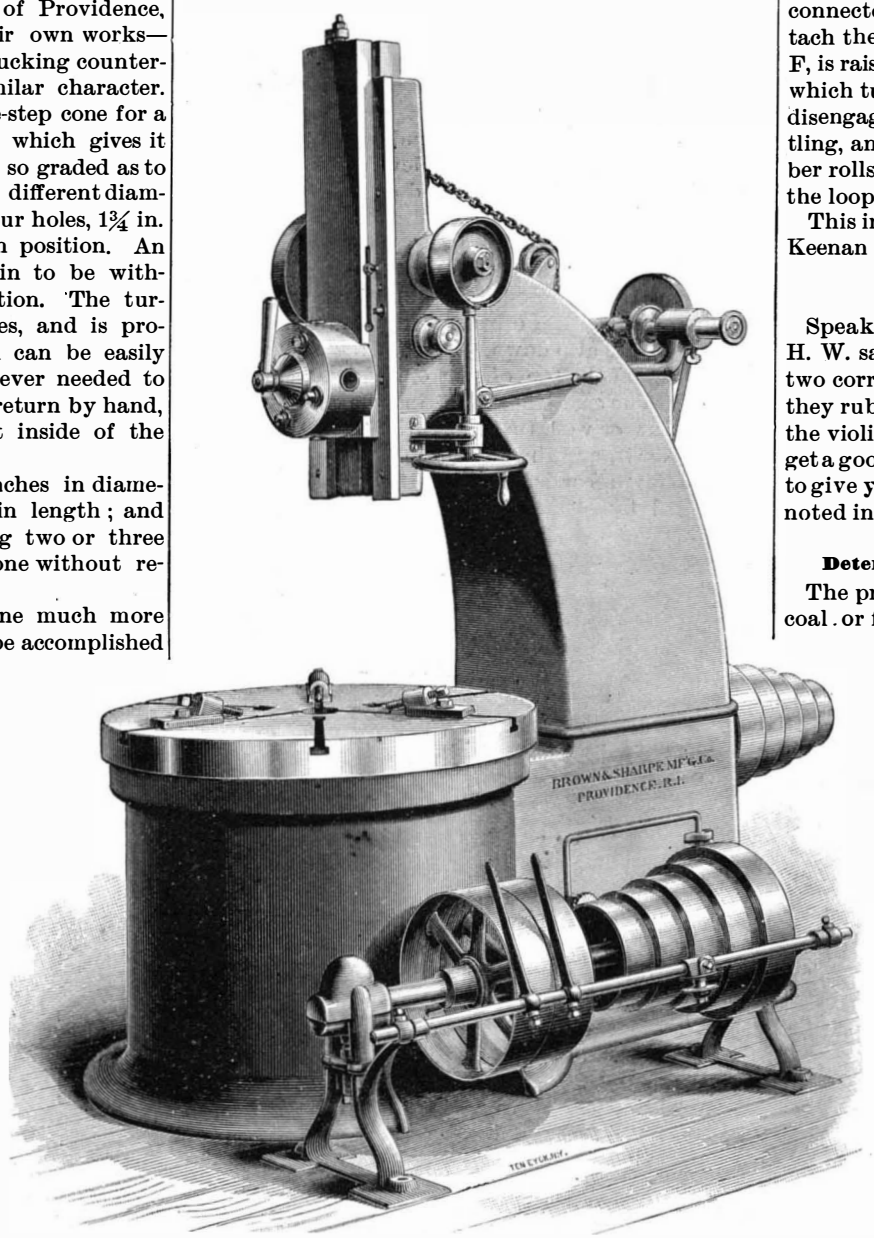
This invention has been patented by Mr. Thomas H. Holman, of Newark, Ohio.

VERTICAL CHUCKING MACHINE.

The machine shown in the accompanying engraving was designed by the manufacturers, the Brown & Sharpe Manufacturing Company, of Providence, R. I., to meet a want long felt in their own works—a ready and convenient method of chucking countershaft pulleys and other work of similar character. The revolving table is driven by a five-step cone for a 3 inch belt, and is geared six to one, which gives it great power. The steps of the cone are so graded as to make the cutting speed uniform for five different diameters of holes. The turret head has four holes, 1¾ in. in diameter, and is securely clamped in position. An adjustable dog allows the locking pin to be withdrawn at any part of its upward motion. The turret slide has a movement of 21 inches, and is provided with an automatic feed, which can be easily and quickly changed from the finest ever needed to the coarsest required. It has a quick return by hand, and is counterbalanced by a weight inside of the column.

The machine will take a pulley 36 inches in diameter, 18 inches face, and hub 12 inches in length; and to bore a 4 inch hole in same, making two or three cuts, and finish by reaming, can be done without removing either the tools or work.

It is evident that with this machine much more work, and of a superior character, can be accomplished in a given time than can be done upon an engine lathe. The work can be more easily trued and secured in place than upon any machine having a horizontal spindle, and the different tools in the turret head can be readily brought into operation in succession. The chips fall through the center of the spindle of the revolving table to the floor, causing no trouble by clogging of reamers, etc.



VERTICAL CHUCKING MACHINE.

Protection against Yellow Fever.

In a letter dated May 26, 1886, addressed by Dr. Domingos Freire, of Rio de Janeiro, to Dr. Joseph Holt, President of the Louisiana State Board of Health, the following interesting statement is made:

I have performed over 7,000 inoculations with full success; the immunity was almost absolute, notwithstanding the intensity of the epidemic this year. More than 3,000 persons who were not inoculated died of yellow fever; while among the 7,000 inoculated, inhabiting the same infected localities, subjected to the same morbid condition, but seven or eight individuals, whose disease was diagnosed as yellow fever, died. It is hardly necessary to say that I have taken notes of but one of these cases. My confreres here have the abominable habit of not giving notice of the fact until after the interment of the individuals, and consequently accuse me of being unsuccessful. You therefore see that, in spite of all this bad will, my doctrine comes out victorious once more by the test of this year, when the epidemic characterized itself by energetic intensity of infection and contagion.

Oil, Albuminoid Matter, and Starch from Corn.

In the manufacture of starch, corn is steeped in water, and kept at a temperature favorable to promote fermentation and putrefaction, for the purpose of loosening the cellular tissue, and to liberate the starch granules as well as possible. In order to accelerate this process, an addition of a small quantity of alkali, preferably caustic soda, is generally made, while other manufacturers, for the dissolution of the inter-cellular matter, prefer the use of dilute acids, especially sulphurous acid.

After 24 to 40 hours' standing, the steeped corn is reduced to a pulp by grinding, from which the starch is then obtained by brushing through sieves and an elaborate process of floating and settling. In the spent liquors remain dissolved the soluble parts of corn, such as gum, sugar, albuminoid substances, gluten, salts, etc., which hold in emulsion fatty and resinous matter, and also suspended cellular and other insoluble matter.

It is this milky liquid to which the inventor, Dr. F. V. Greene, of Philadelphia, applies his process. The liquors are mixed with a small quantity of a solution of sulphate of alumina, which renders insoluble the albuminous substances (for the larger part). These in coagulating envelop and precipitate the fatty matter, as well as the coarser particles, so that the liquor, after settling, is left almost clear. The precipitate is separated by subsidence or filtration, and pressing, and after proper drying forms a grayish coarse powder, the by-product of starch factories, as intended by the inventor. The same treatment is also proposed for the residues of distilleries and vinegar factories.

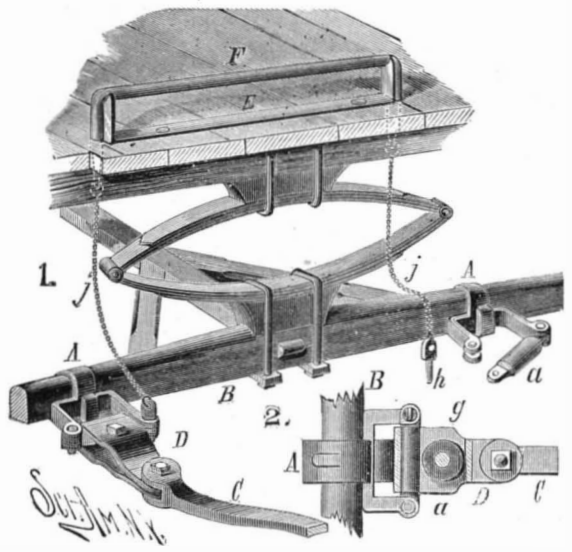
From the dry product, the oil may be obtained by pressure, or by extraction with benzene or bisulphide of carbon, and the exhausted residue is proposed as a fertilizer for the sake of its nitrogenous matter. Mr. Trimble found 4·26 per cent nitrogen in a sample; while Mr. Haines found 4·75 per cent in another sample of this exhausted residue, which amount the inventor expects to increase to 8 per cent by improved operations. The quantity of oil obtained is reported by the inventor as being about one-tenth of the dry precipitate.

The oil, which in its crude state is dark colored, has a good body, and is capable of bleaching. After all odor of the remaining extracting medium (hydrocarbons or bisulphide of carbon) is dissipated, the oil has a very agreeable flavor of its own. Undoubtedly, it would make a very satisfactory soap stock.

The drying of the precipitate, which, in its nature, must be very bulky and pasty, will undoubtedly be somewhat difficult and expensive; considering, however, that the waste waters will by this treatment at the same time be disinfected, the process would be a great boon to the whole community in removing a public nuisance—putrefying waste waters of starch factories. —*Franklin Journal.*

HORSE DETACHER.

Each of the clips, A, secured to the axle, is provided with a swinging bolt, *a*, whose free end is held by a



KEENAN & GARDNER'S HORSE DETACHER.

pin, *h*, between eyes formed on the ends of the other arm of the clip. The thill iron, C, is made with a forked eye to receive a loop, D, through which passes the swinging bolt, *a*. Between the sides of the loop and in front of the bolt is journaled a rubber roller, *g*, which holds the loop into close engagement with the bolt. To the floor of the wagon is secured a rest, E, for the rod, F, to the bent ends of which are secured chains connected with the pins, *h*. When it is desired to detach the horse—as in the case of a runaway—the rod, F, is raised, thereby drawing the pins, *h*, from the bolts, which turn on their pivots and release the loops, thus disengaging the thills. The rubber roller prevents rattling, and when the swinging bolt is released the rubber rolls along the bolt and facilitates the release of the loop.

This invention has been patented by Messrs. C. H. Keenan and J. P. Gardner, of Fort Halleck, Nevada.

Musical Fishes.

Speaking of the musical perch of the Ohio River, W. H. W. says: "The humming or singing is produced by two corrugated bones in the mouth or throat, which they rub together, and the sound is on the principle of the violin or musical glasses. I intend as soon as I can get a good specimen to dissect, or have it done, and hope to give you an item, as I do not think it has ever been noted in any work or paper."

Determination of the Calorific Power of Fuel.

The process consists in burning one gramme of the coal or fuel in a small platinum crucible, supported on the bowl of a tobacco pipe and covered by an inverted glass test tube, through which is passed a stream of oxygen while the whole is placed under water in a glass vessel. The oxygen is fed into the test tube by a movable copper tube, which may be pushed into the test tube so as to come immediately over the crucible. The coal burns away in a few minutes with very intense heat, and the hot gases escape through the water—the bubbles being broken up by passing through sheets of wire gauze, which stretch between the test tube and the walls of the vessel containing the water in which it is placed. The temperature of the water is taken before and after the experiment, and from the figures thus obtained the heating power of the coal is calculated.

THE Agricultural Department at Washington has just sent out large quantities of the eggs of the silk worm by mail to all parts of the country. It has now been satisfactorily demonstrated that the leaf of the Osage orange makes as good silk as that of the mulberry, and that the worms will feed upon it and thrive. The Department is in receipt of letters from girls in various parts of the country, saying that they have made from $20 to $100 by raising silk in this way.

© 1886 SCIENTIFIC AMERICAN, INC

Cast Iron Beams.

Absolute strength in the iron of large castings is of little consequence unless they cool, after pouring, in such a manner as not to leave them subject to considerable internal strains. We know that the late Professor Hodgkinson found that with the iron he experimented upon the compressive strength was six times that in tension, and hence that the bottom flange of a cast iron girder should have six times the sectional area of the top flange. But very few, if any, engineers adopt such a proportion, as the casting would, in all probability, crack in cooling. Most of my audience have seen the cast iron bridge over which the London and Northwestern Railway crosses the Regent's Canal. The first girders for this bridge were cast at the Tinsley Park Works. The iron made there was very hard; and I have been told by my friend, Mr. Shanks, who was engaged there at the time, that it would chill to a depth of two inches. It was used, among other things, for making rollers to roll steel.

The Regent's Canal bridge drawing was sent down there, and they made the patterns and cast the girders. They broke through and through in cooling. Then they altered the patterns, and by pulling off the sand from the thicker portions of the castings, so as to equalize the cooling, a number were cast with the loss of one out of every six. At last, six were sent up to London, and of these every one broke in a thunderstorm. Other girders were then cast of different form. Castings, overstrained in cooling, are apt to break under even a moderate degree of vibration; and the late Mr. Rastrick, once of the Bridgenorth Foundry, and afterward Engineer-in-Chief of the London and Brighton Railway, once stated in evidence how a number of cast iron boilers he had made cracked open after a peal of thunder.—*Z. Colburn.*

CENTRAL POWER LOCOMOTIVE.

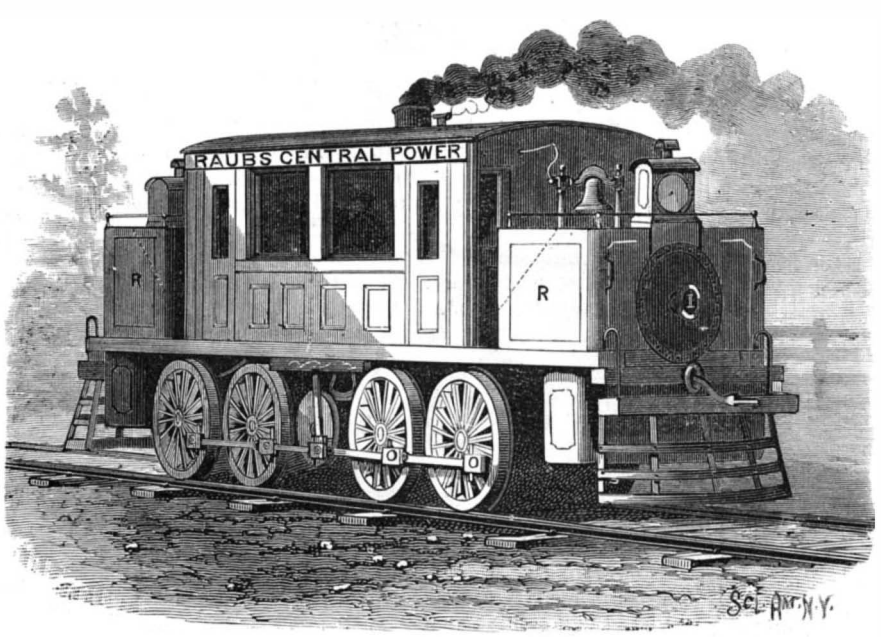
There is now being tested upon the Erie Railroad a locomotive of uncommon appearance, built by the Rogers Locomotive Works after designs by the inventor, Dr. Christian Raub, of this city. The four driving wheels upon each side are united by a rod, connected at the center to a wrist pin, placed upon a disk crank on the end of a shaft journaled between the middle wheels. The cylinders are placed vertically in line above the ends of this shaft.

The two return flue tubular boilers are placed end to end, with the fire boxes adjoining each other. Upon each side of each boiler is a fire door, so that each furnace may be fed from either side. The boilers are united by a tube to equalize the steam pressure, and one safety valve answers for both. There are 132 two-inch flues, 66 inches long, in each boiler. The fire box of each boiler is 56 inches long by 33½ inches wide, and from the grate bars to the crown sheet is 42 inches. The grate surface is 13 square feet, the flue surface 370 square feet, and the total heating surface 420 square feet. There are six water tanks, three at each end of the locomotive, having a combined capacity of 2,000 gallons. At each end are also two coal boxes, each holding three-quarters of a ton.

The cylinders are 16 inches in diameter by 24 inches stroke. The drivers are 62 inches in diameter. The extreme length of the engine is 40 feet, of the wheel base 19 feet 5 inches, and the height from rail to top of cab is 13 feet. The engine is so proportioned and arranged that each half of the total structure, whether divided longitudinally or laterally, is an exact counterpart of the other half, both as regards weight and measure. The consequence is that the center of gravity is at the intersection of the longitudinal and transverse center planes of the entire locomotive. The motive power is placed in the central transverse vertical plane of the engine.

The boiler flues terminate in a smoke chamber at the ends of the locomotive, but, instead of allowing the heat and gases to escape through smokestacks at the ends as in the ordinary locomotive, they are conducted through return flues of a larger size to a smoke chamber, from which leads a stack standing in the center of the locomotive.

The engine shown in the engraving was designed for heavy work, and as it has no dead weight, its entire power can be utilized.



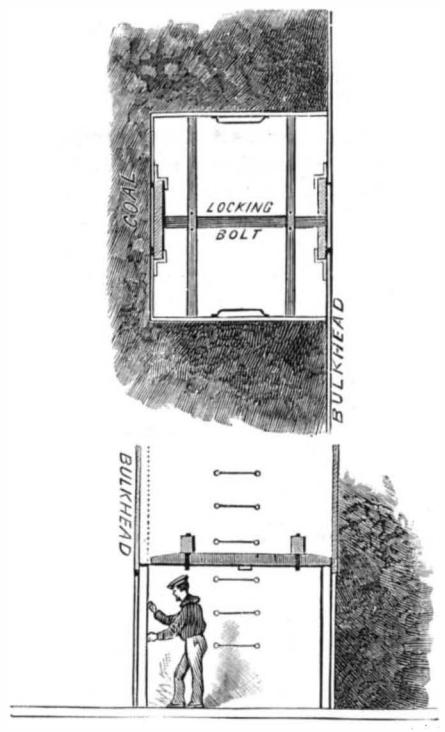
RAUB'S CENTRAL POWER LOCOMOTIVE.

Reward Offered for a New Invention.

The mining owners of Ostraw Rarwin (Austria) have decided to offer a prize of 1,000 ducats for the best invention for preventing accidents in firing and blasting in dusty or gaseous coal mines, or rendering the operation harmless. The invention should fulfill the following conditions, namely: 1. Its use, effects, or explosion should not cause the coal dust to ignite. 2. It should not produce, after the explosion or use, more injurious gas than through the methods heretofore employed. 3. No specially difficult, dangerous, long preliminary arrangements or complicated apparatus should be required in using, setting up, loading, transporting, or lighting. 4. Should not by its use and result be much more expensive than the former blasting methods. Applications should be sent before the end of 1886 to the K. K. Berghauptmannschaft at Vienna.

SAFETY BULKHEAD DOORS.

The cut illustrates an arrangement of bulkhead doors for steamers. For the safety of ships provided with watertight collision bulkheads, it is imperatively necessary that dependence should not be placed on firemen and stokers for closing the doors. It seems clear that had the bulkhead door of the Oregon been closed before the collision occurred, that ship would



HEILL'S SAFETY BULKHEAD DOORS.

still have been afloat. By the construction shown the doors cannot be left open, even when the coal passers are at work. The door in the bulkhead, instead of entering into the coal bunker, has a chamber or well (built watertight) in front of the door of the bulkhead. This well has a second door fitted in it the same as the other one, both doors to slide easily up and down, and a locking bolt is carried on guides on a level with the top of these doors when they are shut down. This bolt extends exactly from the back of the one door over the top of the other door, and it always bears against the back of the door that is up, and extends over the top of the door which is down. It is thus clear that so long as one door is open the other must remain shut until the other door is also down, to permit the locking bolt to slide from off the top of the one door over that of the other. The coal trimmers bring the coals into the compartment or well, they close the open door, slide the bolt over it, and then open the other. All may be done in a few seconds, even by manual effort, and in less if aided by steam or water. No space is lost, as the well is filled with the coal first used. Steps are fitted inside the well to the deck to provide means of exit. Dearly bought experience proves that no reliance whatever can be placed on firemen or trimmers to shut the doors, as they regard it as unnecessary tyranny to be told to shut them when they are so soon to be opened again, and they consequently shirk it on all occasions.

This interesting invention is due to Mr. Laurence Heill, C.E., of Glasgow, Scotland. He refuses to patent his invention, preferring to dedicate it to the service of the public. It really seems as if it would operate as an insurance against sinking and be a factor in the rating of a ship comparable to the bulkhead itself.

The Latest Summary of Pasteur's Work.

Up to April 14, Pasteur has inoculated 688 persons, presumably bitten by mad dogs, with only one death. He had also inoculated 19 Russians bitten by a mad wolf. Of these 19, 3 have died from hydrophobia—about 16 per cent. The usual per cent of deaths from the bites of mad wolves is said to be about 67. Since April 14, Pasteur has treated other Russians bitten by mad wolves and mad dogs. One of the former recently died from the effects of his wounds; one of the latter from hydrophobia, after having been submitted to treatment. This makes in all 720 cases treated, with a total of 5 deaths from rabies, despite treatment. Pasteur has found that the rabies resulting from wolf bites is the same as that of dogs, and only more dangerous because the bites of wolves are more numerous and severe.

Unprofitable Customers.

Almost every machine-shop owner has suffered more or less from the friend who drops in to have a rivet put in his knife, the spring of his pistol fixed, or some other one of the million little odd tinkering jobs done. Of course, he does not expect to pay for it, "it is such a trifle, you know," nor does the proprietor like to make a charge, and thereby lay himself open to being thought "small." When a charge is made, it is seldom commensurate with the cost of doing the work, and rarely, if ever, pays for the annoyance and diversion from more important work. Such jobs, it is safe to say, are always distasteful, but the proprietor does not know exactly how to refuse to do them. Not only do they take more time than would be supposed, but considerable time is wasted in getting back to regular work, and in many cases other employes have to wait on the one doing the job, machinery is idle, and the minds of the men have to go back and gather up the threads of the work in hand. Such jobs are an imposition, not intentional perhaps, because those imposing them are ignorant of the annoyance they cause, but this does not lessen their cost in any measure. The machinist who does not want such work should plant himself squarely against it, and refuse to take it at all. A few words of explanation would satisfy any reasonable applicant.—*Industrial World.*

Testing Watertight Compartments.

Warned by the fate of the Oregon, the Russian Government, says *Engineering*, has been inaugurating an exhaustive test of watertight compartments, which it contemplates applying to all new vessels, and probably to older ones as well. The man-of-war selected was the corvette cruiser Vitiaz, which was finished last autumn, and is under sailing orders for the Pacific this month. Five weeks ago an intimation was conveyed to the dockyard authorities at Cronstadt that the watertight compartments would be tested in succession, and instructions were given to survey them afresh, and make good any defects that might be discovered. If the official report is to be believed, every effort was made to meet the wishes of the Admiralty, yet when the compartments were actually filled with water the fluid gushed through numerous apertures which had escaped the eye, and in some cases to an extent which would have been troublesome at sea after a serious accident. To secure perfection several of the compartments were filled two or three times, and it was only after a deal of door adjusting and leak stopping that the corvette was pronounced fit to proceed to sea. A final test was then applied in the presence of the higher Admiralty authorities, a number of the nine large watertight compartments being filled at once without any leakage. Besides insuring the rectification of all defects in the watertight compartments, it is claimed in the report that the tests have proved of great service in training the crew; they have promoted confidence in the buoyancy of the vessel, and have led to several improvements of an important character. It has been suggested that in this year's naval maneuvers in the Baltic the tests should be continued by ordering so many of the watertight compartments to be filled, in the event of a torpedo cutter approaching within hitting distance of a man-of-war; but the defects revealing themselves in the case of the Vitiaz have made the authorities apprehensive of ill results, unless harbor tests are applied beforehand.

© 1886 SCIENTIFIC AMERICAN, INC

Correspondence.

Test for Borax.

To the Editor of the Scientific American:

The ordinary test requires the use of a porcelain vessel in which the powdered mineral is placed in combination with sulphuric acid and evaporated over a fire, then alcohol is added and ignited; if borax be present, a fine green flame is produced. For practical prospecting purposes, I found the above cumbersome. I therefore modified the process to a simpler form. Take a small piece of wood—a splinter, or twig, or match divested of its head. Dip one end of the wood in sulphuric acid, then roll the moistened part in a pinch of the powdered mineral, so that it should be coated. Roast over the flame of a candle, or light, or embers; pour two or three drops of alcohol on the roasted mineral, and ignite. The characteristic green flame of borax will show, for a second or two, if the desired mineral be present. The process takes less time than it does to describe the same. With a small vial of sulphuric acid and another of alcohol, the prospector for borax is provided with the means for detecting the mineral. FRANK CALVERT.

Dardanelles, May 14, 1886.

Condensation of Smoke by Electricity.

To the Editor of the Scientific American:

In your issue of April 24 you reproduce from *La Nature* an article on the condensation of smoke by electricity, based on the experiments of Prof. Lodge, of Liverpool.

It will interest your readers to know that though Dr. Lodge has been the means of bringing the interesting action of the electric discharge prominently before the public recently, he is by no means the discoverer of it. Should great successes follow its application on a large scale, it is not the experiments of Dr. Lodge which will "become classical," as stated by the article you quote from, but the experiments of one C. F. Guitard, who made the discovery and carried out essentially the same fundamental experiments in the year 1850. He describes them in the *Mechanics' Magazine* of 1850, page 346. W. M. HUTCHINGS.

Dee Bank Lead Works, Bagillt, N. W., May 21, 1886.

The following is the communication to the *Mechanics' Magazine*, signed C. F. Guitard, and dated London, October 29, 1850: "Some time since, in experimentalizing on the electric state of the atmosphere, I employed for that purpose a large glass cylinder about 18 in. high and 9 in. diameter, open at bottom and having a neck at top. In placing the lower end of this cylinder in water the more perfectly to exclude the air, and allowing small quantities of tobacco smoke to enter the neck at top, the smoke, after assuming various actions, according to, probably, the hygrometric state of the atmosphere, would gradually spread itself into a cloud filling the cylinder, and at length, as successive portions came in contact with the sides of the cylinder, condense. Sometimes half an hour would elapse before this effect took place. It now struck me that if I brought a wire from an electrifying machine into the neck of the cylinder, the air would immediately become charged with electricity, which would cause each portion of the smoke to fly to the sides of the cylinder, and that thus more rapid condensation would take place. The effect produced was perfectly magical. The slightest turn of a small electrifying machine produced immediate condensation. It was astonishing to see how small a quantity of electricity produced a most powerful effect. I am not aware that attention has ever been drawn to this subject: and the question will probably arise, Has electricity anything to do with the condensation of steam in the condenser?"

African Telegraphy.

To the Editor of the Scientific American:

The system of sound telegraphy used by the people living on the border of the Gulf of Guinea, West Africa, is of interest as a primitive solution of the problem of communication through short distances. The instrument is made as follows:

Take a log of hard wood, about two feet long and about a foot in diameter.

Plane off one side longitudinally to a surface four or five inches wide. In the center of this surface mark off an elongated and somewhat distorted Greek cross. The longer arms are placed longitudinally, and occupy about one-third of the plane surface. The transverse arms are three times as broad, and extend entirely across this surface.

The natives dig out the wood within the outline of the cross, and from there gradually hollow out the whole log. The sides, beginning at the center, are trimmed off laterally toward the ends, which are rounded off.

The instrument is now ready. It will be perceived that by the method above described we have a hollow drum with four tongues in the center, each being of a different thickness, so as to produce a different sound when struck.

Two pieces of bamboo, the size of a man's wrist and about two feet long, are selected and stripped of the hard outside, which leaves the soft, pithy portion for use. This bamboo is of a peculiar kind, free from knots and solid throughout. With these sticks, used in a proper manner on the four tongues of the drum, a combination of sounds is produced which, in connection with time as used in music, forms a perfect telegraphic language, readily understood by the initiated, the air being the transmitter. With this simple instrument the natives of the Gulf of Guinea readily communicate with each other for a distance of a mile at least on land and a much longer distance by water.

Messages can be sent long distances in a short time by parties at different points passing them along from one to the other.

The writer has seen canoes coming down a river from the bush markets signaling people in the town, and giving and receiving general news at a distance of fully three miles. BERTRAM SPARHAWK.

Waltham, Mass.

History of Telegraphy.

To the Editor of the Scientific American:

The 17th of last April was the centenary of Baron P. J. Schilling, the inventor of the electro-magnetic telegraph, born in Revel, Russia, 1786.

His first experiments with copper wire as electrical conductor were begun in 1810. In 1812 he successfully exploded a mine across the Neva, by means of an electric current. The same experiment was publicly repeated in 1814 on the Seine at the triumphal entrance of the Russian Czar Alexander the First into Paris.

In 1815 Baron Schilling began to investigate the action of electrical currents on a magnetic needle, and in 1820, after numerous experiments, he constructed the first electro-magnetic telegraph.

The Czar Nicholas, inspecting the invention at the house of Baron Schilling, had written on a piece of paper, "Je suis charme d'avoir fait ma visite a M. Schilling,"* and these words were afterward transmitted by telegraph without any mistake.

In 1837 Baron Schilling received an imperial order to connect St. Petersburg and Cronstadt by a telegraph line; unfortunately, the inventor's untimely death—25th of June (7th of July) of the same year—prevented the realization of this plan.

Baron Schilling's contemporaries, as it so frequently happens, were entirely unable to appreciate his great invention; so, when, explaining it before a scientific committee, he proposed to hang the wires on poles, his plan was received with laughter and derision: "Your invention is pure nonsense, and your *airy* wires are truly ridiculous." Such was the answer from the scientific body.—*Translated from the Russian Journal, The Universal Illustration.* L. GOLDENBERG.

No. 1 Ann Street, New York city.

Harmony of Colors.

By harmony of colors we understand colors placed side by side in such a manner that they do not injure the effect of each other; rather, on the contrary, complete each other, *i. e.*, they gain in intensity.

Those who are familiar with the harmony of colors can, by using objects of familiar use, make such selections in fitting up apartments, in dressing, etc., so that with the greatest simplicity they are able to produce a more favorable effect than is possible with the most extravagant expenditure without a sense of harmony in color.

A merchant, dealing in colored goods, can very greatly improve the appearance of his stock by knowing how to group them in such way as to produce a harmonious effect. Very often, owing to a lack of taste with reference to colors among dealers, it will be found that the silks in one shop will appear much fresher and brighter than in another. This difference in effect of the colors is, however, nothing more or less than that one merchant arranges his goods so that the colors are in harmony, while the other does not follow any definite plan. In the first instance the goods gain, while in the second they lose in intensity of color. The attention of the ladies is particularly called to the importance of harmony in colors, for most of them in the selection of their colored dresses, bonnets, and trimmings, produce the greatest discord in the composition of the colors. Harmony in color does not depend on the will or caprice or personal taste of an individual, but it is based on the unchangeable laws of nature, which we shall immediately discuss.

Red and Green.—A red body reflects green rays, while, on the other hand, a green body reflects red rays. Therefore green is the color which completes red, and similarly red is the color which completes green. Both colors, therefore, gain in intensity.

Blue and Orange.—A blue body often reflects orange rays, and inversely an orange body will frequently reflect the blue rays. Orange is, therefore, the complementary color of blue, and *vice versa*, therefore each color intensifies the other.

Violet and Greenish Yellow.—A violet body reflects greenish yellow, and inversely a greenish yellow body reflects violet. Both colors, therefore, complete each other, and intensify each other.

Indigo and Yellow.—Indigo reflects yellow, and yellow indigo rays, hence they are complementary and intensify each other.

It would carry us too far to describe all the other colors which are complementary.

All spectral colors are complementary, that is, the two colors lying opposite each other; for instance, the upper carmine and the intermediate green.—*Lithographer and Printer.*

Not so Bad for the Farmer.

Grain growers and other tillers of the soil, who feel like complaining at the low prices of farm produce now prevailing, should remember that agricultural interests are not alone in the matter of depreciation of prices. The fact is that during the past seventy years farm products have increased largely in price, while manufactured articles have decreased. An interesting comparison of prices for farm produce is shown in the following table, compiled for the *Milling World:*

	1816.	1886.
Wheat, per bushel	$0 44	$0 99
Oats, per bushel	15	41
Corn, per bushel	20	46
Barley, per bushel	25	80
Butter, per pound	12	32
Cheese, per pound	6	10
Eggs, per dozen	5	12
Cows, per head	15 00	50 00
Hay, per ton	5 00	17 00
Straw, per ton	4 00	15 50
Sheep, per head	75	2 00
Farm labor, per month	8 00	18 50

Certainly in "the good old times," so often regretfully referred to, farmers were not overpaid, and these figures show that farm labor has during seventy years increased over 100 per cent, and the selling prices of farm produce have increased from 100 to 400 per cent. On the other hand, the comparison of manufactured articles shows large decreases, as may be seen in the appended figures:

	1816.	1886.
Steel, per pound	$0 17	$ 0.12
Nails, per pound	12	4
Broadcloth, per yard	16 00	4.00
Wool blankets, per pair	15 00	7.00
Cotton cloth, per yard	30	12
Calico, per yard	25	6
Salt, per bushel	$1 00 to 4 00	15 to 25

Here are enormous differences against the manufacturers and in favor of the farmer. It would appear that agriculture has really been favored at the expense of mechanical industry, and the grain growers and general farmers should cease to consider themselves the only class of victims of the present depressed business conditions.

The Flying Dutchman.

"The cruise of H.M.S. Bacchante, 1879–1882," is the title of a book compiled from the private journal, letters, and note books of Queen Victoria's two grandsons, Prince Albert Victor and Prince George. The Princes have given a very creditable account of their journey around the world. Their experience with the phantom ship, the so-called Flying Dutchman, which they encountered near Sydney, is thus described:

"July 11, 1881.—At 4 A.M. the Flying Dutchman crossed our bows. A strange red light, as of a phantom ship, all aglow, in the midst of which light the masts, spars, and sails of the brig, 200 yards distant, stood out in strong relief. As she came up, the lookout man on the forecastle reported her as close on the port bow, where also the officer of the watch from the bridge clearly saw her, as did also the quarterdeck midshipman, who was sent forward at once to the forecastle. But on arriving there no vestige nor any sign whatever of any material ship was to be seen, either near or right away to the horizon. The night being clear and the sea calm, 13 persons altogether saw her, but whether it was Van Dieman, or the Flying Dutchman, or who else, must remain unknown. The Tourmaline and Cleopatra, who were sailing on our starboard bow, flashed to ask whether we had seen the strange red light at a quarter to eleven A.M.

"The ordinary seaman who had this morning reported the Flying Dutchman fell from the foretopmast crosstrees, and was smashed to atoms. At a quarter past four P.M., after quarters, we hove to, with head yards aback, and he was buried in the sea. He was a smart royal-yard man and one of the most promising young hands in the ship, and every one feels quite sad at his loss. At the next port we came to, the admiral also was smitten down."

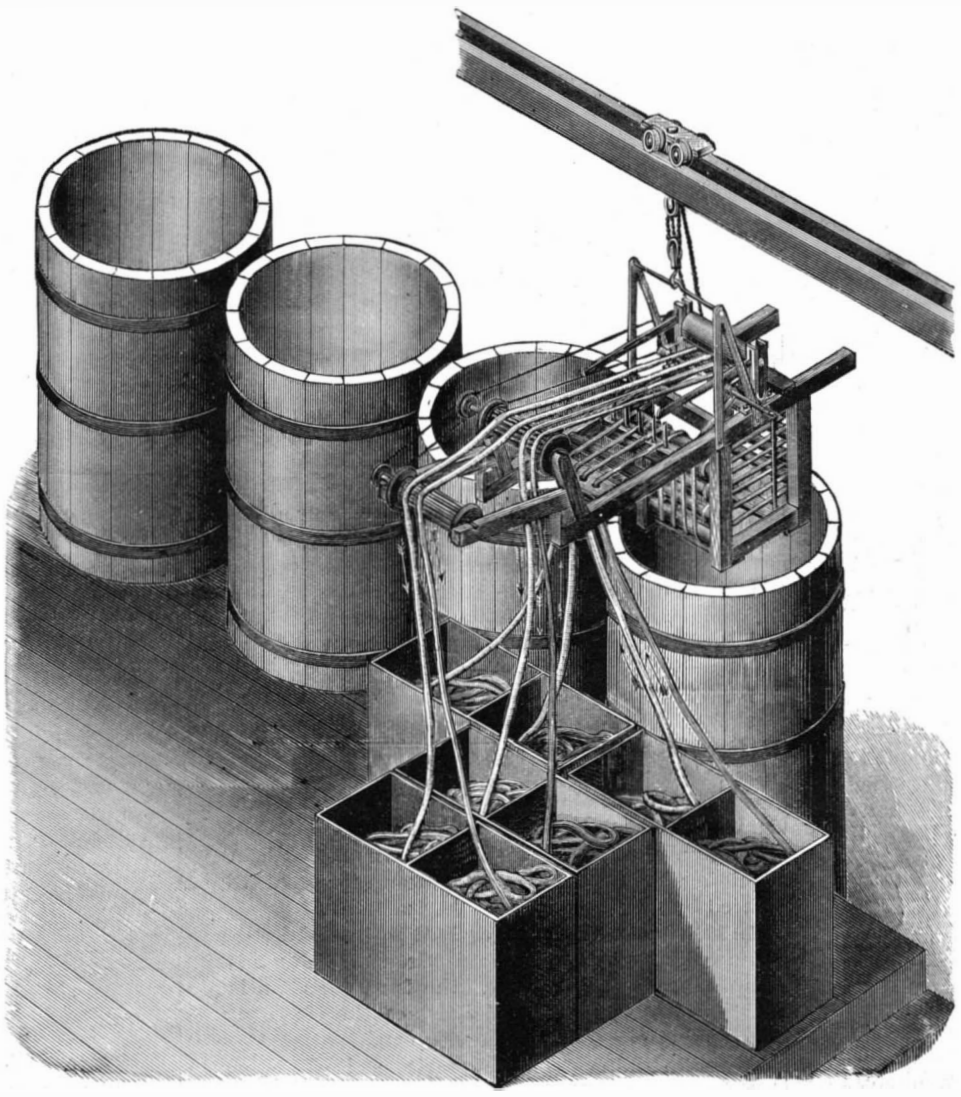
THE King of Servia, according to the journals, has issued the following: "Whereas it is irrefutably proved by science that the so-called antiseptic treatment of wounds yields more beneficial results than all other methods, we are pleased to order that henceforward the said antiseptic plan of treatment be solely employed in all the hospitals of our kingdom, and that corrosive sublimate and iodoform be used until our further disposition."

* "I am charmed with my visit to M. Schilling."

© 1886 SCIENTIFIC AMERICAN, INC

NEW DYEING APPARATUS.

The accompanying engraving illustrates an apparatus designed by Messrs. Thomas Wood & Co., of Twenty-second and Wood Streets, Philadelphia, Pa., for dyeing warps indigo, blue, and black. The colors are formed by passing the warps through the liquor contained in a series of from four to fifteen vats, according to the quantity of warps to be dyed and the shade required. The warps pass from the inside boxes through the machine in the first vat and are then delivered into the outside boxes. The boxes are then shifted, the dyeing machine is lifted up and moved along, by means of a pulley block and truck, as shown in the cut, to the second vat; the warps make the passage through the liquor in this vat in the same manner, and so on through the series of vats until the proper shade has been acquired. When there is a large number of vats, two or more machines are employed, the one following the other. This process is simple and economical, and gives very superior results. Messrs. Wood & Co. also make machines for dyeing fancy colors, with a capacity to work four, six, or eight warps at a time. The carrier rollers of these machines are copper, and the squeezing rollers are made either of wood, iron, or iron covered with rubber.

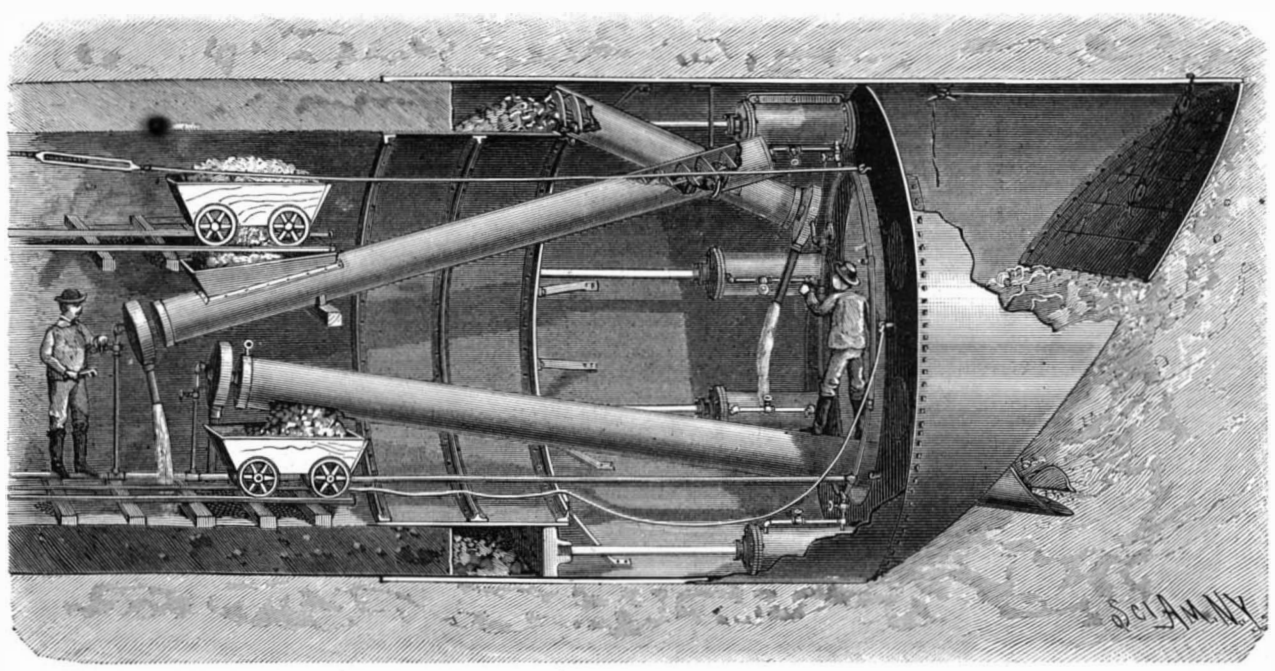


THOS. WOOD & CO.'S NEW DYEING APPARATUS.

IMPROVED SEWER TUNNELING MACHINE.

Situated just behind the diaphragm, within the outside iron cylinder of the machine, are several hydraulic cylinder presses, which are connected with the necessary pipes, so that they can be operated independently or collectively from one principal pipe running to some place in or outside of the tunnel. Each press is also provided with a relief valve, which can be so adjusted as to relieve the pressure at any desired point. The piston of each press works toward the rear of the machine or away from the heading, and is provided with a heavy iron follower, made segmental in shape, in order to fit in between the outer and inner rings of the machine. The duty performed by these presses is twofold: To compress and solidify the fresh body of concrete or other material forming the tunnel, and, after this is accomplished, to advance the shield of the machine to a position to receive a new ring of the concrete. The great pressure thus exerted—from three to four hundred pounds to the square inch—permits of much better work than is possible with hand labor, since the concrete can be worked comparatively dry, thereby preventing shrinkage in the finished work, which is almost immediately fit for its intended uses. The presses are so arranged that the water pressure can be made to act on either side of the piston.

Around the outside of the diaphragm is a series of strong iron hooks, and embedded in the finished tunnel, some distance in the rear of the machine, are other substantial fastenings, corresponding in number and location with the others. Wire ropes, provided with turn buckles, reach from the hooks to the fastenings. This rigging is intended to guide the machine in any direction; by shortening or lengthening the ropes, so that the pressure of the hydraulic presses can be exerted on that side of the machine in which the slack guys are located, the machine can be turned toward the taut ropes. The angle of the front of the machine is made to vary, to suit the angle at which the material will stand, so that in case any hard obstacle should be encountered, it can be got at without making any extra excavation. When the material is too soft to stand at any reasonably practical angle, then strong ribbed or braced iron plates can be used in between the angle irons, which are riveted to the inner top part of the forward end of the shield, and held in place by block and tackle. Plates can also be used in front of the diaphragm to any height from the bottom that may be required to stop the flow of material from a point in advance of the shield. When these plates are used, the diaphragm can be dispensed with entirely. The stone, gravel, sand, cement, or other material is dumped from cars running upon an elevated track into a hopper at the lower end of a conveyer, which carries it up to or near the roof of the tunnel, where it is dropped into another conveyer, which delivers it into the chamber formed of the two rings of the machine, the segmental followers and the completed work. When this chamber is full, the supply of concrete is stopped, and the hydraulic pressure is turned on to compress the material and advance the machine. The material in front of the diaphragm, when soft, can be entirely removed by means of the conveyer, which empties it into a car running upon a track along the bottom of the tunnel; but if this is of tough clay or similar substance, the diaphragm can be taken away and men employed to pick and shovel it into the conveyer. All the conveyers are designed to be operated by water motors, attached to the end of the shaft, receiving their supply from the main pipe furnishing the presses.



BROWN'S IMPROVED SEWER TUNNELING MACHINE.

When bricks are used in the construction of the sewer or tunnel, the lower half of the inside shell can be omitted; the upper half will then serve as a centering for the arch.

The saving obtained by the use of this method of building sewers—which is the invention of Mr. F. O. Brown, of 39 Broadway, New York city—is apparent. In the ordinary open-cut, the timber and excavation necessary to reach the tunnel become useless as soon as the work is finished. This method also saves the expense of taking up and replacing the pavement, and does away with the inconvenience of blocked streets.

The Horses of the World.

Professor D. Leonhard, of Frankfort, gives in the *Mittelrheinische Verbandkalender* for 1886 the following statistics of the horses of various countries and cities:

According to Schwarzenecker, Prussia possesses altogether 2,313,817 horses, or 97 horses for 1,060 inhabitants (91 per 1,000). Omitting the detailed census of the number in each division of the empire given by Prof. Leonhard, we may note that, according to the census of 1873, the German Empire contained altogether 3,352,231 horses, about 14 per cent younger than three years; of the horses older than this, in round numbers, 70 per cent were employed in agriculture, 10 per cent in commerce and industries, 3·2 per cent in army use, 0·4 per cent as stud horses, and 3 per cent as saddle and carriage horses. This gave 82 horses per 1,000 inhabitants.

Austria-Hungary possesses three and one-half millions, or 99 per 1,000 inhabitants. Hungary alone has 2,000,000. France has altogether 2,882,850 horses and 300,000 mules, or 78 horses per 1,000 inhabitants, and 54 per square kilometer.

Denmark (census of 1881) possesses 316,570 horses; Belgium, 283,163 horses, or 60 per 1,000 inhabitants; Holland, 250,000, or 73 per 1,000 inhabitants; Italy (census of 1868), 657,544, but in 1879 she had only 615,457 horses, besides 293,868 mules; Switzerland, in 1866, about 105,000, or 40 per 1,000 inhabitants; Spain (in 1865), 680,373, besides 2,319,846 mules and asses; every year there are killed in the bull fights 3,000 to 4,000 horses; Portugal, 88,900 horses, 50,390 mules, and 127,950 asses; Russia (in 1872), 21,570,000 horses; Sweden and Norway, 655,456, or 115 horses per 1,000 inhabitants; Greece, about 100,000; United States of America, 9,504,000; Canada, 2,624,000; Argentine Republic, 4,000,000; Uraguay, 1,000,000; Australia (in 1871), 304,000.

Prof. Leonhard gives for different cities the figures cited below: Berlin, 32,527; Breslau, 4,581; Bremen, 2,199; Buda-Pesth, 11,611; Cologne, 1,850; Dantzig, 2,385; Dresden, 5,641; Frankfort-on-the-Main, 3,000; Hamburg, 4,171; Hamburg, with suburbs, 7,600; Hanover, 4,158; Konigsberg i. P., 4,477; Copenhagen, 5,302; Leipzig, 2,483; Monaco, 5,883; Rome, 11,733; Stockholm, 3,506; Stuttgart, 2,591; Vienna, 14,317; Paris, 64,247; (the Omnibus Company has most horses of any corporation, 12,000); London, 200,000, of which about 60,000 are used in public carriages, 10,000 for street cars, and 60,000 for omnibuses.

The number of horses in St. Petersburg is not given, but is supposed to be about the same as in London.

[The horses of the city of New York are estimated as being between 60,000 and 75,000.—ED.]

THE Newark Filtering Company, manufacturers of the Hyatt system of filtering, 141 Commerce St., Newark, N. J., has just placed one of its 10 foot filters in the Carew Paper Mill, at South Hadley Falls, Mass. This is one of the most complete systems for the purification of water, probably, that has ever been introduced into this country.

© 1886 SCIENTIFIC AMERICAN, INC

THE WORKSHOP OF JAMES WATT.

Heathfield Hall, near Birmingham, was for many years the residence of James Watt, the famous engineer, a fact which gives it historical interest.

The Hall stands almost in the very heart of the populous suburb of Handsworth, but concealed therefrom by a belt of forest trees, and the latter and happiest portion of the life of the great inventor was spent within its walls.

Happily, although much of the Heathfield estate has been handed over to the road makers and builders, and the house itself is threatened, the small room, or garret, which Watt utilized as a workshop, and in which he often spent several days and nights without leaving it, yet remains, with all the tools, furniture, partly developed inventions, etc., in exactly the same position as when he turned his back upon it for the last time. This "classic garret," situated immediately under the roof in the back part of the house, and approached by a narrow staircase, is a small room, with plain whitewashed walls and ceiling, and lighted, though insufficiently, by a low, broad window looking into the shrubbery. The most conspicuous objects therein, as shown in our sketch, are two sculpture-copying machines, invented by Watt, by means of which he produced replicas of medallions and busts, which he afterward sent to his friends as the work of "a young artist in his eightieth year."

Among other relics of this famous man we noticed, on one of the shelves that line the room, a plate containing a withered bunch of grapes, a large packet of snuff (its scent has long since fled), his clay tobacco pipe, and last, but not least, the identical wash-leather apron in which Watt was accustomed to do his work, the chemical stains on it bearing silent testimony to the patient, practical labors of its illustrious possessor.

A proposal is now being considered by the Birmingham authorities to remove this historical collection to Aston Hall, the various articles to be arranged in a suitable room in as nearly as possible the same relative positions as they now occupy. Interesting and valuable they must be wherever placed, but in another building and in another neighborhood they will not appeal to our imagination so powerfully, or excite the same emotions, as they do when we see them in the room where the inventor worked, and which must always be associated with his name.

In order that this proposed act of vandalism may not be carried out, a suggestion has been made to Mr. J. W. Gibson Watt, a descendant of James Watt, to purchase Heathfield Hall and the grounds belonging to it, to be utilized as a public park and museum in memory of Watt. The matter is now before the trustees, and we sincerely trust that it will meet with a favorable reception, and that the necessary funds will be speedily forthcoming to enable them to effect this praiseworthy object.—*London Graphic.*

Structure of Steel.

In a recent discussion before the Iron and Steel Institute, Sir Henry Bessemer gave some interesting particulars of an experiment he had made thirty years ago, suggested by observing the difference between French and English lump sugar. The English sugar has a much larger crystal than that made in France, and in the latter the material is cooled quickly and stirred while cooling, while English sugar is allowed to stand and crystallize slowly. Sugar candy stands for days while it is in process of crystallization, the operation being retarded by the application of heat. In this case the crystals are very bold and pronounced. It is also known that in heavy castings, where the heat is kept in a long time by the mass, large crystals are apt to be formed. The experiment referred to was made in the following manner:

A hole was made in the earth, and this was lined with sand; into this a mould that would produce a spherical casting was placed. Between the mould and the sand a quantity of charcoal was packed. The mould then had a quantity of malleable iron made on the Bessemer process poured into it, and the whole was covered up for ten days. The metal had a heavy dose of phosphorus, ½ to ¾ per cent, but no carbon. At the end of the ten days the globular mass was dug out. A smart tap with a two pound hammer had the effect of sending off a shower of crystals, and there appeared to be no cohesion among the particles of the mass. On hammering one of the crystals on an anvil, it could be flattened down, thus showing that each individual crystal was a particle of malleable iron, although the cohesion of the crystals to each other was so slight. Sir Henry thought this experiment worth detailing, as it tended to show the great importance of the time allowed for cooling in iron and steel.

Scarlet Fever.

Another case showing the communicability of contagious diseases by clothing is reported from Bath, Me., where a girl had scarlet fever at a boarding school. After recovery she returned home, and a trunk containing the clothing she wore while sick was put away in the garret. Six months later two little children were playing in the garret, and, opening the trunk, took out some of the clothing. In a week both were taken very ill with the disease, and one died. There were no other persons ill with scarlet fever in the community.

Cost of Drilling a Gas Well.

The cost of drilling a gas well is stated by a Pittsburg contemporary to be about the same as that of an oil well under the same conditions. It varies usually from $3,500 to $6,000 according to the depth. Where the productive measures are nearer the surface, the cost is materially less. The method pursued is the same in both cases. A derrick is first set up on the intended site of the well, and a wrought iron pipe driven through the soft earth until it reaches the solid rock, usually at a depth of 60 to 100 feet. The weight of the drills with the attached "jars" is 3,000 to 4,000 pounds. These rise and fall four to five feet, and are constantly rotated, so as to bring the bit into contact with the entire circumference of the drilling. For a depth of 500 feet the hole is bored 8 inches in diameter, and is cased with 5⅝ piping. Beyond this depth the hole is continued with a diameter of 6 inches until gas is reached or the well abandoned. A casing of 4 inch piping is used for this lower portion. Under ordinary circumstances, forty to sixty days are required for the drilling.

Ordnance Supplies.

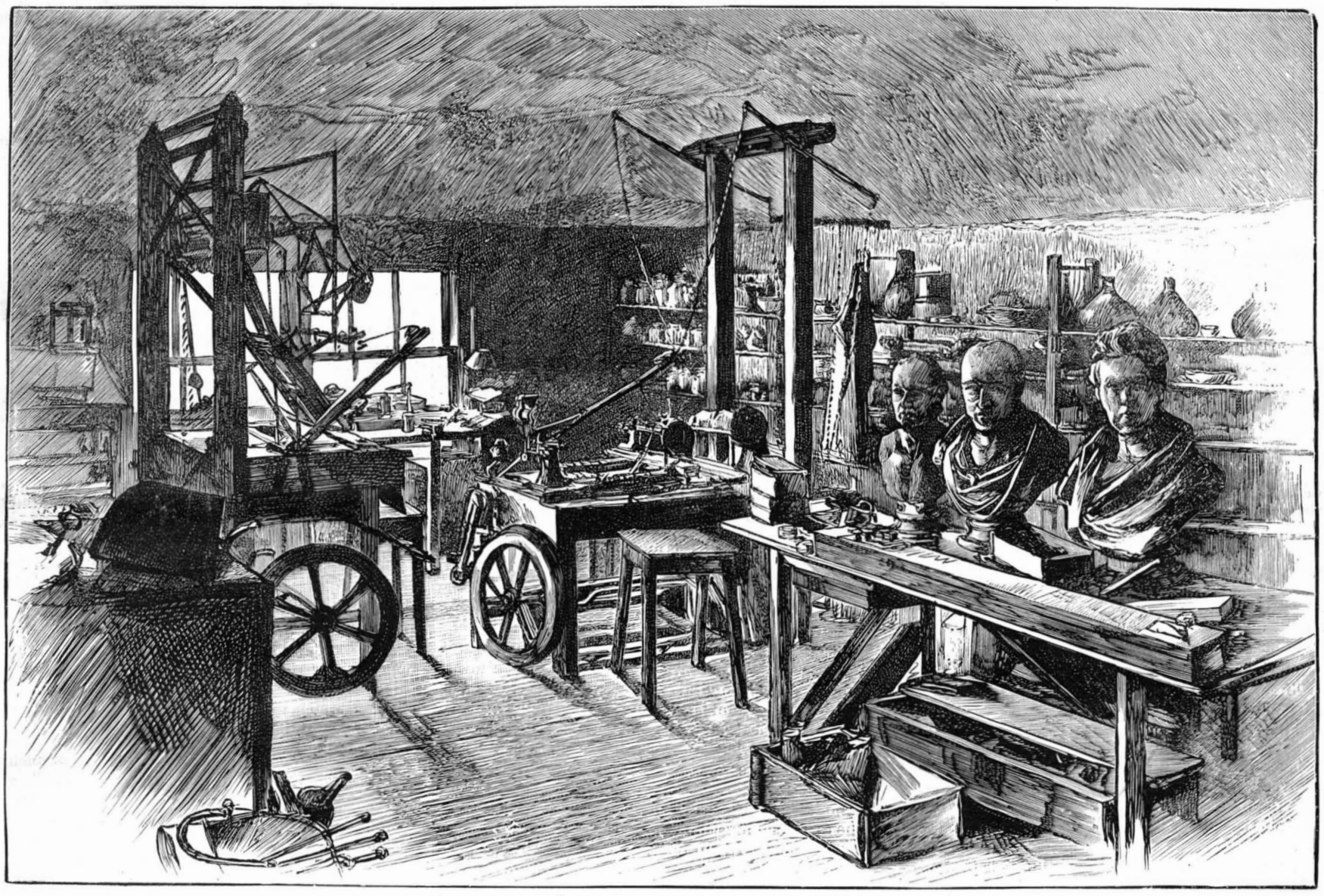
The following is the bid of the Midvale Steel Company, of Philadelphia, Pa., on steel forgings for the Ordnance Department: 10 and 12 inch forgings for breech block, 44 cents per lb.; 8 inch forgings for breech block, 75 cents per lb.; forgings for spindle, 54 cents per lb.; forgings for race plate, 64 cents per lb.; forgings for block carrier, 80 cents per lb.; forgings for lever, 64 cents per lb.; forgings for hinge pins, 64 cents per lb.; forgings for bushing ring, 45 cents per lb.; forged bar for securing rings, 64 cents per lb.; and forgings for gas check rings, 64 cents per lb.

The same company put in the following bid on mortar hoops: Rolled hoops, 36 cents per lb.; trunnion hoop, $1 per lb.

The bid for furnishing cannon, carriages, etc., was as follows: Hotchkiss & Co., 6 Hotchkiss revolving cannon, 37 millimeters caliber (1·45 in.), $7,800; carriages, $3,000; limbers, $2,250; accessions in reserve parts for guns and carriages, $1,050; ammunition wagons, $4,500; accessions for wagons, $600; loading tools, $100; percussion shells, fuse, cartridge case, and wad, $1 each; canister shot, 62 cents each.

The following are the bids on cored shot: West Point Foundry Association—shot, $29 each; copper bands, $2.25 each. South Boston Iron Works, Boston, Mass.—$30.30 and $2. Talbott & Sons, Richmond, Va.—$30 and $2. Tredegar Company, Richmond—$60 and $3.

The bids for supplying the army with a cast iron body for a 12 inch mortar were: South Boston Iron Works, Boston, Mass., $3,500; Builders' Iron Foundry, Providence, R. I., $5,000.



THE WORKSHOP OF JAMES WATT AT HEATHFIELD, NEAR BIRMINGHAM.

THIS ROOM HAS NOT BEEN DISTURBED SINCE THE DEATH OF WATT IN 1819.

© 1886 SCIENTIFIC AMERICAN, INC

RECENT DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—Northern District of Illinois.

HUTCHINSON *v.* EVERETT *et al.* EVERETT *et al. v.* HUTCHINSON.

BOTTLE STOPPER PATENT.

Blodgett, J.

Where one made, in 1874, a device which was claimed to embody an invention patented to another in 1879, which earlier device never went into practical use, *held* that the 1874 device was an abandoned experiment, and was not sufficient to defeat the patent.

It is hardly conceivable that one who was in fact the prior inventor of a device, on seeing it in use, and knowing that another claimed to be the inventor, would have uttered no protest and laid no claim to the invention.

A claimed to have invented a device in 1874. B obtained a patent for the device in 1879. Subsequently A applied for a patent for an improvement on the device patented to B. *Held* that the inference was that if A had been in fact the inventor of the device patented to B, he would have shown and claimed it in his application, instead of applying for a patent on what was at most only an improvement on such device.

The fact that a person claiming to have invented a device in 1874 or 1875 knew that another had put it into public use in 1878 is sufficient to defeat his claims to take out a patent in 1883, even if he had been the inventor.

Patent No. 289,928, issued December 11, 1883, to Amos F. Parkhurst, assignor to Edward H. Everett, for a bottle stopper, canceled because it interferes with patent No. 213,992, issued April 8, 1879, reissued June 17, 1879, as reissue No. 8,755, to Charles G. Hutchinson, for an improvement in bottle stoppers.

United States Circuit Court.—District of New Jersey.

WATSON *v.* BELFIELD *et al.*

CLAY PRESS PATENT.

The true test to determine whether suggestions made to an inventor should deprive him of the claim to originality in the invention is t inquire whether enough has been communicated to enable him to apply it without the exercise of more invention.

A general knowledge of the substance of the invention covered by letters patent No. 169,871, of November 9, 1875, to John Watson, for improvements in clay presses, was communicated to the inventor before he attempted to embody it in a practical apparatus, and hence his patent is void for want of novelty in the invention.

U. S. Circuit Court.—Southern District of New York.

BOLAND *v.* THOMPSON.

GLOVE SEWING MACHINE.

The first claim of reissued letters patent No. 9,586, granted to Claude N. Boland, February 22, 1881, for an improvement in glove sewing machines, is void, such claim not being found in the original, the application having been filed two years, two months, and eight days from the date of the original, and the rights of the public having intervened.

The patentee was a foreigner, unfamiliar with the English language, and was ignorant that the claim in controversy had been omitted from the original patent until a fortnight before the application for the reissue. *Held* that these facts were not sufficient to excuse the delay.

To every patent the public is an indirect party. It is for the advantage of the whole people that all meritorious inventions shall be protected; but it is clearly the duty of the courts to see to it that the public is not required to pay tribute for that which may be fairly considered as abandoned by the inventor.

The claim in controversy was presented in the original application, and twice rejected. The applicant knew of the rejection, and his solicitor acquiesced in such ruling. *Held* that the proper course to secure the claim was to appeal, and that there was no such inadvertence, accident, or mistake as entitled the patentee to a reissue.

The Hygiene of Old Age.

Speaking of the conservation of life in the aged, Dr. H. C. Wood, of Philadelphia, mentions the case of a prominent citizen, who, having died at the age of 81, was quoted by his neighbors and associates as being gathered like a ripened sheaf. But Dr. Wood objects to the simile as being inappropriate, for the gentleman in question was full of physical and mental vigor up to within a week of his death, and there was no more reason that his life should terminate so suddenly than if he had been but threescore.

The eminent practitioner believes that, aside from deaths from accidents and preventable causes, the duration of life is frequently influenced by success and failure. The man who has succeeded—and by this we mean one who has so spent his years that they form a gratifying subject for self-review—can, by proper care, prolong his life much beyond the traditional threescore and ten. But a sense of failure in life is apt to become the indirect cause of premature death, for it exhausts the vitality and detracts from the recuperative power of the system.

To make old age possible, however, the several vital organs must be approximately equal in strength. The man of ordinary physique, who possesses this fortunate balance of power, will in all probability outlive an athlete whose development has been unequal. Excessive strength in one part is in fact a source of danger. An overdeveloped muscular system invites dissolution, because it is a constant strain upon the less powerful organs, and finally wears them out. Death in the majority of cases is the result of local weakness. It often happens that a vital organ has been endowed with an original longevity less than that of the rest of the organism, and its failure to act brings death to other portions of the system, which in themselves possessed the capabilities of long life.

As old age creeps over a person, the conditions of the animal organism change, and they possess less elasticity to meet and overcome such strains as can be invited with impunity in youth. Exposure to inclement weather, the sudden shock of good or bad news, are frequently sufficient to terminate a life which with care would be able to endure many more years of active usefulness. It is therefore highly desirable that persons of advancing years should make their personal habits the subject of careful study, and with the help of some wise counselor regulate their daily living in accordance with the changed conditions of their animal economy. Of all the questions which must thus be decided, few are more important than that of diet. The loss of the teeth in old age should be replaced when possible by artificial substitutes. But even with the best product of the dentist's skill, mastication is apt to be imperfectly performed, and the food of old people therefore should be easily digestible, and at the same time comparatively soft and readily comminuted. In its nature, the food should not be too stimulating. Many are injured by an excess of nitrogenous food. The kidneys, being weakened by age, are unduly strained if meats and other rich foods are eaten in excess. Milk and its products or cereal preparations cooked with milk are among the most suitable and perfect foods. In many cases, too much food is taken, under the impression that the lessened vitality requires increased fuel to maintain the vital warmth. But this is a great mistake, for it must be remembered that growth has now ceased entirely, that but little exercise is taken, and that the function of food is reduced almost solely to supplying the comparatively small waste of a quiet existence.

Dr. Wood believes quite strongly in the use of wine for aged persons, as it assists digestion and quiets the nervous irritation which is apt to be the result of feeble health. The danger of the formation of any evil habit when a patient has reached the age of seventy is so small that the most temperate and conscientious physician need not hesitate to recommend the use of such a tonic. The question of temperature is another, demanding more consideration than is usually bestowed upon it. When the vital fires are losing their energy, and the force of life is waning, it becomes imperative that artificial heat shall supplement as far as possible their deficiencies. Careful heating arrangements and warm clothing are necessary not only for the comfort of old people, but for their very existence. And so, in all the details of their living, the altered conditions of the organism must be considered, and their requirements satisfied. In our busy, hurried lives, the science of old age has been too little considered. The span of life, though lengthening, is still unnecessarily curtailed.

How They "Kill" Engines.

"Tell me how St. Louis strikers 'kill' so many engines and render them useless for service, will you?" asked a reporter for the Denver *Tribune* of an engineer who was busy oiling the links of his engine in one of the local round-house yards.

"How they 'kill' engines, hey? Well, the quickest and surest way is to take this away," the runner replied, laying his hand on the throttle lever. "Shut the throttle by pushing in the lever pin, disconnect the fulcrum connections with the boiler head, stick the lever under your coat and march off with it, and the engine is useless. Even if she is near the machine shop it will require a couple of days to replace the lever, at a cost of $14, as it must be forged and turned, and the brake throttle ratchet must be cast, filed, and polished. That is much better than to carry off connecting rods, as I saw represented recently in an illustrated paper. It would take two men at least to cart away one connecting rod, which, you know, connects the crank pin of the forward driver with the crosshead, though that disables a locomotive, of course."

"Several Vandalia trains were 'killed' by the water gauges being knocked off, so the dispatches said."

"If that is all the dispatches said, they didn't cover all the ground, because the water glasses would be left, and an engineer can run without the one if he has the other. If the gauges are knocked out, the holes can be readily plugged up, and new gauges only cost 75 cents each. But if gauges and the water glass with its fillings are bursted, the engine is no good.

"Any attempt to run will end in burning her flues and crown sheet. You see where these parts are covered everything is lovely, but with low water they burn out. I've seen a burnt crown sheet drop down from its braces almost into the grate. An explosion occurs at such times, which tears everything to pieces. But then the strikers on the Gould system have burned no engines, and any parts they have carried off will turn up all right after the strike."

"Are there other parts of the machinery that can be taken away to 'kill' a locomotive?"

"Oh, my, yes. Take down the eccentric links or take off the valve stems, and your engine is dead. The favorite way, when an engine is on the road, is to put out the fire, open the blow off cock, which you see standing out from the side of the firebox under the cab, and let out all the water. Then the engine must be hauled to the nearest tank and filled up before she can be fired up.

"As for 'killing' engines in the round-houses, the strikers remove such of the parts I have mentioned as will require the longest time to replace, and very likely at the same time let the water all out of the boilers."

Diphtheria.

Diphtheria is a terrible disease, and when it breaks out in a school, or in a family where there are several children, unless the very best precautions are observed it is likely to spread, for it is a disease that may be communicated from one person to another. It is contagious. Regarding the different measures employed to prevent the spread of this disease, we very greatly prefer the fumes of burning sulphur. We regard sulphur as the most effective disinfectant we can use for the purpose of preventing the spread of diphtheria in schools and in families where several children are exposed, and it has a salutary effect upon those already suffering from the disease. We have had the care of scores of diphtheria patients, and we can refer to quite a number of families of children where the disease was limited to one child, and we verily believe that the fumes of burning sulphur were instrumental in preventing the spread of the disease in these cases.

In all cases where diphtheria breaks out in a school, no children should be permitted to go to the school from houses where the disease exists. After school hours, in the evening, the school rooms should be thoroughly fumigated with sulphur. This should be done daily, but the house should be free from the sulphur fumes during school hours, for the coughing and sneezing that might result from the sulphur fumes would create great annoyance and confusion. Where diphtheria prevails in a family, the patient or patients, if there are two or three attacked at the same time, should be isolated, confined to one room, and all the children not affected should be kept in some remote part of the house, or removed from the house entirely if practicable. In either case, whether any of the children are removed from the house or not, every room, including the one occupied by the patient, should be fumigated with sulphur two or three times daily.

The most convenient method of fumigating is to drop a small pinch of sulphur upon a hot stove, if there is one in the room; if there be no stove in the room, a few coals on a shovel or other convenient utensil may be carried into the room, and the sulphur may be dropped on the coals. A little experience will soon enable any one to determine how much sulphur to burn in each room. It is not necessary to fill the room so full of these sulphur fumes as to suffocate us, and if we happen to burn a little too much sulphur in any given case, and the fumes become offensive, the doors and windows can be opened for a minute or two.

Other disinfectants may be employed, but these sulphur fumes will permeate every crevice in the house; they are breathed by us, our clothes are saturated with them, and, withal, we regard this as the most practical and effectual method of disinfection against the spread of diphtheria that can be adopted. And where diphtheria prevails in a neighborhood, and families fear its outbreak among their children, they should resort to sulphur fumigation daily, whether diphtheria has appeared in the house or not; this may prevent its outbreak in families that might otherwise suffer from it. At least this precaution does not cost much, and can do no harm. These sulphur fumes will do us no injury.—*American Med. Journal.*

Treatment of Whooping Cough with Illuminating Gas.

Dr. W. T. Greene (*Med. Press*, April 7, 1886) suggests an easily available improvement on the old plan of sending children on visits to gas works. His plan is to attach a piece of rubber tubing to a burner, the tubing being long enough to reach the floor. The gas is turned on just enough to make a perceptible odor, and the child is to inhale it for a few minutes at a time as often as convenient.

© 1886 SCIENTIFIC AMERICAN, INC

EXPERIMENTS WITH LYCOPODIUM.

T. O'CONOR SLOANE, PH.D.

Lycopodium is a fine powder, the seed, or more correctly the spores, of a club moss. These are members of a curious family of cryptogamous plants that, from the demand in commerce for the spores, have a certain importance. They form the living representatives of a once numerous and important group of large trees, now mostly extinct—the lepidodendrons and sigillarias. In the carboniferous ages these plants grew to immense size, and it is supposed that in the moist air laden with carbonic acid gas their growth

EXPERIMENT WITH LYCOPODIUM.

was extremely rapid. From them and their associates the beds of coal that we now burn, anthracite, bituminous, and cannel, were formed. To-day this mighty series has dwindled into insignificance, the survivors being little more than herbaceous in habit. Long strings of some of its varieties are sold for Christmas decorations, the stems being tied together.

The spore cases are comparatively large vessels. Exactly how the germination takes place is unknown. Each spore case contains a quantity of the spores—microscopic bodies that, collected, form the finest conceivable powder, of a yellowish brown color. So fine and smooth are the spores, that a bottle half full acts almost as if filled with water. The lycopodium, when the bottle is inclined and slightly jarred or shaken rapidly, slides down to a level, or nearly level, surface, and, on more active agitation, a species of waves or ripples can be produced on the surface.

On microscopic examination, each grain is found to approximate to a spherical shape, with three faces meeting pyramidally on one part of its superficies. Several very interesting experiments can be performed with this substance.

For a long time past it has been used in theaters for the production of flashes of light. Owing to its fine state of division and its resinous nature, it catches fire with great readiness when disseminated in the air, and produces much the same effect that a sudden inflammation of a large body of gas would exhibit. Its fineness is such that, practically speaking, it assimilates itself to the gaseous state. If a small quantity is placed on a card and shaken out over a candle flame, bright, lightning-like flashes will appear. By proper management, absolutely explosive mixtures of lycopodium and air can be produced. In these respects it reminds us of the dust of coal mines and flour mills, to which so many fatal explosions have been due.

By virtue, probably, of its resinous nature, it is moistened by water only with considerable difficulty. Spread over the surface of water, it forms a coating that does not for many hours become wet, and that prevents other bodies from coming in contact with the fluid. It does this, not by acting as a membrane, but by subdividing the surface of the water so as to magnify the effects of surface tension. It also seems in a certain sense to increase the coherency of the surface, and to make it tend to move all at once, if an effort is made to disturb it.

Having sprinkled some over the surface of water in a glass, the experimenter may immerse his finger in the fluid. He will notice no difference in the sensation, the water feels cold as ever, but will observe that as his finger descends it carries with it the coating of lycopodium, that now, like a membrane, wraps itself around his finger, and adheres to it under the water. The effect produced is sometimes quite peculiar, the finger appearing enveloped in ice, and magnified by the shape of the glass. On withdrawing it, however, it will be found perfectly dry. The adhering powder can be shaken off on the surface of the water. As long as enough powder is kept upon the surface of the water, the immersion can be repeated over and over again. The finger will never become wet. The lycopodium divides the water into such small areas that, in virtue of its surface tension, it is held back and away from the skin. If all the dust is drawn down, and the water comes in contact with the unprotected finger, it will become wet above the lycopodium.

One curious illustration of the efficacy of the powder in preventing contact between a solid and liquid may be obtained by lowering a coin into the water. The coin may rest upon a bent wire or be lowered by a thread. The coating of lycopodium will close over and envelop it as it descends, and it can be lowered down to the bottom of the vessel and again extracted perfectly dry. It is just as if it were inclosed in a sac of India rubber.

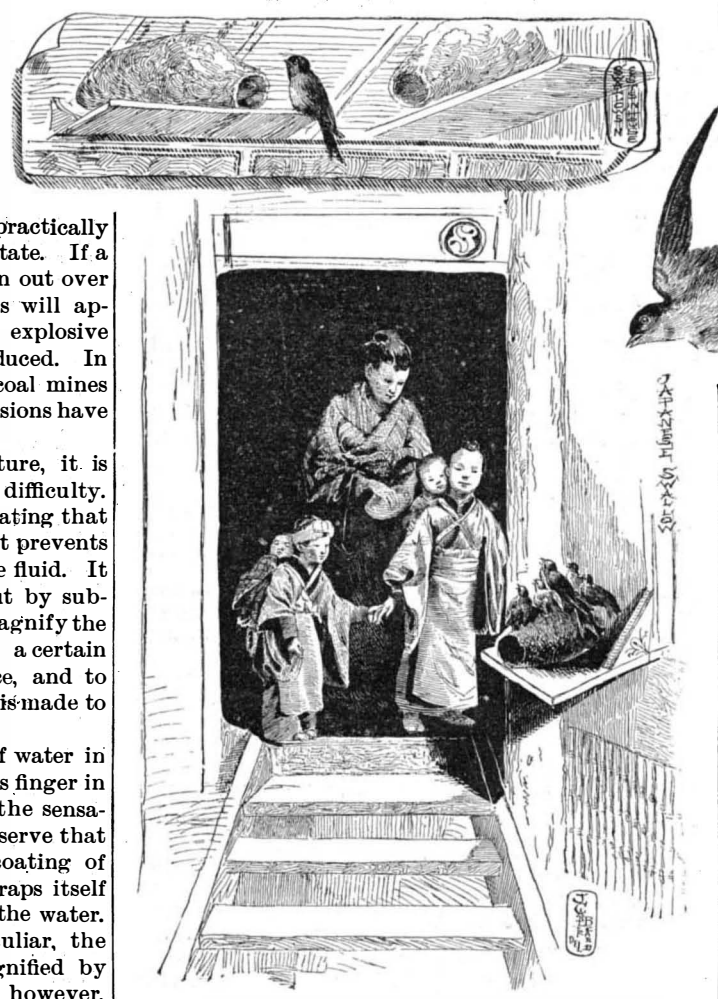
From a vessel of clean water, drops may be taken and allowed to fall gently on a somewhat thickly coated surface of water. They immediately form into spheroids, not coming in contact with the water below. They can be rolled about and against each other without coalescing or sinking, as, curiously enough, there is a species of adherence that obtains between the lycopodium and the water, so that the drops become coated with it. If a piece of glass is dusted over and a drop placed on it, the rapidity with which the drop rolls about, as the glass plate is inclined, is quite striking. In a lantern this may be shown with good effect, the projected image of the drop flying across the field of view like a pistol ball.

The experiment of the floating needles may be repeated on a lycopodium-coated surface with magnified effect. Pieces of wire of some thickness, steel pens, and the like, float upon the surface, just as they do on mercury. Here again it may be noticed that the actual depression is quite small. The surface is but slightly affected by the weight resting on it.

The coated surface forms an admirable field for the display of magnetic figures. A tray of paper may be used to contain the water. It must be made waterproof by treatment with shellac or melted paraffine. The paraffine from a candle melted over the surface by the heat of an oven, or by being held in front of a fire, will suffice. A shallow layer of water is placed in it, and the tray rests upon the poles of a powerful magnet. It is dusted with lycopodium, the excess is blown off, and iron filings dropped on the surface from a considerable height. The filings may need a little assistance by jarring, but they will often, without it, arrange themselves in the magnetic curves, as shown. At the poles, where the attraction is strongest and where most filings accumulate, the magnet draws them down, depressing the surface quite curiously, but not with power enough, under ordinary conditions, to break through the film. It is a case of two forces being insufficient to overcome the surface strength. Here gravity and magnetism co-operate, but cannot break through.

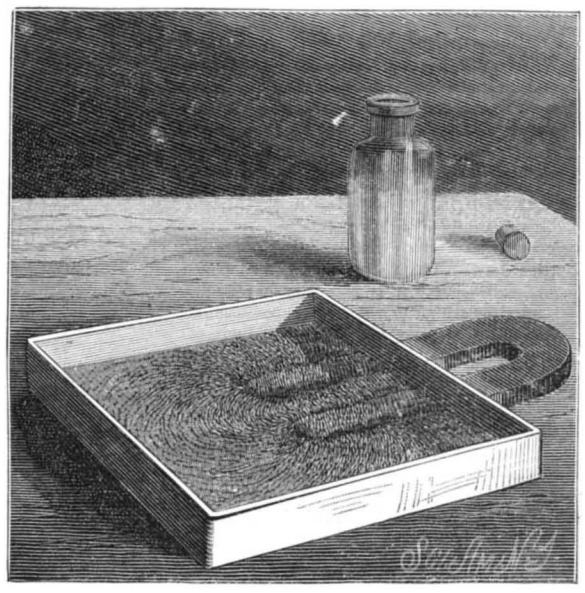
BIRDS' NESTS IN JAPANESE HOUSES.

Nothing recommends itself more to the traveler as a national trait among the Japanese than their gentleness and kindness to children and animals.



BIRDS IN JAPAN.

It is in consequence of this that not only the domesticated, but the so-called wild, animals and birds of this country are far bolder and easier of approach than in other parts of the world. There is here a species of swallow, much resembling the chimney swallow of Europe, which actually frequents the houses, and twitters and circles about the heads of the people in the different apartments, as we have seen tame canaries when set free from their cages in the house where they are kept. Only in this case the swallow is free to come and go through the open window or door, and gets his own living in the open air. Even in Europe and America this beautiful little bird is a favorite. Humphry Davy says of it: "The



EXPERIMENT WITH LYCOPODIUM.

swallow is one of my favorite birds, and a rival of the nightingale, for he cheers my sense of seeing as much as the other does my sense of hearing. He is the glad prophet of the year, the harbinger of the best season. He lives a life of enjoyment among the loveliest forms of nature. Winter is unknown to him, and he leaves the green meadows and forests of England in autumn for the myrtle and orange groves of Italy and for the palms of Africa. He has always objects of pursuit, and his success is sure. Even the beings selected for his prey are poetical, beautiful, and transient. The ephemeræ are saved by his means from a slow and lingering death in the evening, and killed in a moment when they have known nothing but pleasure. He is a constant destroyer of insects, the friend of man, and a sacred bird. His instinct, which gives him his appointed season, and teaches him when and where to move, may be regarded as flowing from a divine source, and he belongs to the oracles of nature, which speak the awful and intelligible fiats of a present Deity."

Of course, this character of symbolic grace and modesty goes far to recommend the bird to so artistic a people as the Japanese, and it is, in consequence, almost a national emblem, being a favorite subject with their decorators, and finding a place with the crane and the lotus as a religious type. It is, however, in the building of its nest and rearing of its young that the Japanese swallow pays the highest compliment to, and exhibits the greatest amount of confidence in, its protectors; for, however incredible it may seem, its habitation is built, and its little family brought up, in the living rooms of Japanese families, and this not only in unfrequented parts of the country, but, as Professor Morse assures us, in the midst of their largest cities. The Proressor, than whom no more interesting and acute observer of Japanese life exists, in speaking of these nests, says that they are not built in any remote part of the house, but in the principal and oftenest visited rooms, where the inmates are the busiest about the household affairs. He adds that the children take great delight in watching the nests in process of construction, and in the rearing and education of the young birds afterward.

As soon as a nest is fairly begun, some member of the household puts up a neat little shelf beneath it to prevent litter on the floor, and the bird, accepting this as a "locus in quo," returns, year after year, to rebuild or repair and reoccupy the old nest in the same place.

Illuminating Water by Electricity.

At the new Cirque Nautique in Paris there is an aquatic performance of a very novel character. After the conclusion of the ordinary gymnastic and riding entertainment, the carpet is removed from the floor of the ring, and the latter entirely submerged. A circular pond is thereby produced, and an electric arc lamp illuminates the water from below. The swimming performers appear like mermen and mermaids in the translucent depths of the sea. The general installation throughout the building is a very fine one, and includes both arc and incandescent lamps; the lamps soleil producing a beautiful effect.

© 1886 SCIENTIFIC AMERICAN, INC

ENGINEERING INVENTIONS.

A balanced piston for steam cylinders has been patented by Mr. Thomas Joyce, of Scranton, Pa. It has grooves in the lower sides of its ends, with perforations leading into the grooves, whereby the weight of the piston will be carried by the steam, and undue wear of the lower side of the piston will be prevented.

A car coupling has been patented by Mr. Michael Spelman, of Shreveport, La. This invention covers improvements on an automatic coupling heretofore patented by the same inventor, other parts being now employed instead of shouldered springs on the sides of the drawhead, to allow it to tilt downward when required.

A car coupling has been patented by Mr. William B. Little, of New York city. Combined with a drawhead having a cavity is a weight block sliding in the recess, and having a coupling pin and swinging tongue, with other novel features, to make a coupling that is cheap, durable, and automatic, and that will act whether the cars be on a straight or curved track.

A car coupling has been patented by Mr. John A. Craig, of Lauderdale, Mo. Its construction is such that when the link is raised the contact of a meeting drawhead will jar it down into coupled position, and to uncouple it is necessary to raise a lever, from either the side or top of the car, so that the moving parts of the coupling may be operated without going between the cars.

A railway ties has been patented by Messrs. Adam N. Warner and Thomas J. Deakin, of Williamsport, Pa. Cross ties are formed of metallic bed plates having a central groove open at the top, within which fit the shanks of T-shaped blocks, their upper flanged portions resting upon the upper marginal portions of the grooves, and these blocks form the bearers or sleepers for the rails.

MISCELLANEOUS INVENTIONS.

A musical cigar show box has been patented by Mr. Anthony Ward, of Brooklyn, N. Y. Combined with a show box and its cover and a music box escapement is a rod and arm and spiral spring, so arranged that the music will be started and stopped by the opening and closing of the show box cover.

A watch pouch has been patented by Mr. Michael Dooley, of North Adams, Mass. It is made with an edge opening having opposite wires or stiffenings at its margin, and with notches or bends adapted to inclose the stem of the watch, or having a clasp, being neat and inexpensive and calculated to exclude dust.

A wire stretcher has been patented by Mr. Henry Clemons, of Downing, Mo. It consists mainly of an oblong iron frame having a shaft journaled therein, and with a handle, ratchet, and pawl for rotating it, the frame being in two parts, enabling it to be folded in compact form, and so it can be used in angles or corners.

A wagon jack has been patented by Mr. William T. Easterday, of Watsonville, Cal. Combined with a standard formed of sections having teeth is a follower with looped arms, and a lever with a pin connected to the follower by a link or links, with other novel features, to make an improved construction of such device.

A zither attachment for music boxes has been patented by Mr. Alfred Sueur, of New York city. It is placed below the comb and provided with an adjusting device, the attachment consisting of a roll of paper on a strip of wood or metal, so that the roll can be brought in contact with the under sides of the teeth of the comb.

A nut lock has been patented by Mr. John Bare, of Mount Union, Pa. It consists of a carrier plate or support having a pair of bolt holes, and a pair of locking plates pivoted at one end centrally between the holes, their other ends movable in arcs between the holes, the device being adapted to take up the wear of the bolt.

A clothes rack has been patented by Mr. William H. Ertell, of New York city. Combined with back and end boards are hinged bats which can be turned down into and supported in a horizontal position, and held in place when turned up in a vertical position, being designed for use in bedrooms, and so made as to be compactly folded when not in use.

A perpetual dial calendar has been patented by Mr. Charles R. Talcott, of Valparaiso, Ind. It is composed of two tablets, one a revolving dial and the other a fixed or stationary tablet, by the combination of which the day of the week or month, and the day in any given year, may be quickly and accurately ascertained.

A leather rolling machine has been patented by Mr. Charles S. Ames, of Bishop, Ill. It has disk shaped formers on a shaft in connection with concave grooved rollers, the rollers and disks having their shafts geared for joint action, the machine being designed to roll flat leather strips to a U-form, to be used around a center filling to make round lines, etc.

A stall for handling vicious horses has been patented by Mr. Charles F. Shedd, of Fairfield, Neb. In the side walls are vertically sliding doors, the front and rear of the stalls likewise having doors, and there are leading ropes and crank shaft, with other novel features, whereby men may be able to work each side of the horse in the stall to harness or saddle him without danger, and there will be no liability of the horse getting cut in the stall.

A device for assorting animals has also been patented by the same inventor. It consists principally in a special manner of arranging the gates and compartments of an inclosure, whereby the gates may be easily operated from the outside, and stock cut out and worked into one or the other of the compartments, as may be desired.

A hose coupling has been patented by Messrs. Albert F. Symes, of Salem, and Joseph Buchtel, of Portland, Oregon. It consists of a section with a radial opening, on which is fitted a ring with a lug projected through and movable circumferentially in the opening, with other novel features, whereby the coupling may be easily effected and released, and a simple construction is provided.

A means for preventing disturbances on telephone lines has been patented by Messrs. John E. Dann and John Lapp, of Honeoye Falls, N. Y. The device consists of a copper cylinder around the telephone wire, but insulated therefrom and connected with the earth, a rubber tube inclosing the copper cylinder to protect it from exposure to the atmosphere or moisture.

A churning device has been patented by Mr. John S. Dickey, of Payne, Texas. Its construction is such that a continuous rotary motion may be given to the churn body and a vertical reciprocating motion to the dasher, the churn body being adapted to serve as a drive or fly wheel, the device being simple and so made that no part is likely to get out of order or wear quickly.

A fastening for satchel frames, etc., has been patented by Mr. Louis B. Prahar, of Brooklyn, N. Y. With the case attached to one part of the frame and the catch to the other part, is a stationary stem and a sliding stem, with a spiral spring connecting them, and a sliding latch connected with the sliding stem and engaging with the catch.

A handle fastening for hand satchels has also been patented by the same inventor. Combined with the frame and its handle caps, having perforations in the opposite sides of their lower parts, are open rings with their ends bent inward and inserted in the perforations, hinging staples being attached to the frame and engaging with the open rings, the device being simply made, and yet such that the fastenings will not be liable to separate when subjected to a severe strain.

A stop watch has been patented by Mr. Eugene J. A. Dupuis, of New York city. There is a pinion on the arbor carrying the second hand, continually engaged with a wheel, loosely mounted on one of the arbors of the watch works, the loose wheel having a spring friction device, and there being other novel features, to simplify construction and provide a mechanism that can be operated rapidly and exactly.

A machine for caning chair bottoms has been patented by Mr. James S. Hodgson, of Brooklyn, N. Y. The invention consists principally of a suitable frame, combined with lifting devices for spreading the warp strands of cane, so that the weft strands may be easily and quickly passed between them, there being also a special form of shuttle for carrying the free end of the weft strand of the cane.

A drop light and chandelier has been patented by Mr. John Trigge, of Mount Vernon, N. Y. The extension of the chandelier has rack teeth engaging a cog wheel placed in a box on the chandelier, the cog wheel being connected with an automatic brake device, consisting of a disk having spring-pivoted cams and an adjustable brake band, to facilitate the adjustment of the drop light and prevent its sliding when once adjusted.

A combined clod crusher and land marker has been patented by Messrs. Abraham Bartmes, Clement V. Whallon, and David W. Frick, of Coldwater, O. The clod crusher is a rectangular frame with closed bottom, pivoted about its middle to accommodate itself to the undulations of the ground, and carrying a toothed roller to break up clods and lumps; the marker is a transverse bar, with shoes or runners, loosely attached to the crusher proper.

A windmill has been patented by Mr. John W. Currie, of Solomon City, Kansas. The mill head is a cross wrought iron coupling, its vertical arms lengthened by short tubes, the lower extension tube being stepped and journaled in the mill tower and the upper tube carrying the operating mechanism, with other novel features, designed to make a durable and inexpensive mill, which can be easily thrown into and out of gear.

A tobacco curing barn has been patented by Messrs. William B. Farrar and John J. Thornton, of Greensborough, N. C. It has an underground conduit, whose walls are composed of damp earth, for supplying damp, earthy air, the conduit having a cut-off, and the rack bars or tier poles have their strips set vertically, and there is a combined net and screen suspended horizontally beneath the racks of tobacco, with other novel features to facilitate the operation, avoid scorching the leaf, and secure uniform bright color and sweet taste.

A process of manufacturing ammonium bichromate and one for the manufacture of bichromate of potash form the subject of two patents issued to Mr. William Simon, of Baltimore, Md. The first consists in the conversion of sodium bichromate into ammonium sodium chromate and the decomposition of this salt into sodium chloride and ammonium bichromate by the addition of hydrochloric acid. In the other the potassium bichromate is manufactured by decomposing chromate of sodium by chloride of potassium and hydrochloric acid.

The stock and hay frame and stock loader recently patented by Mr. John T. Carrington, of Clay Center, Kansas, is designed to provide an improved frame or wagon box, for use for stock or hay and other like material, and the stock loader combined therewith can be used on railroad chutes.

NEW BOOKS AND PUBLICATIONS.

USEFUL THINGS TO KNOW ABOUT STEAM BOILERS. By G. B. N. Tower. New York: American Steam Boiler Insurance Co.

The primary object of this book is to teach owners and users of boilers how to use and care for them, in order to lessen the liability to accident, which it is the business of the company publishing the book to insure against. The author is an eminent engineer, holding the position of supervising inspector of the company, and the great variety of useful information which the book affords is put in terms so plain as to be easily within the comprehension of the simplest fireman or 'prentice boy.

A MANUAL OF CHEMISTRY.—ORGANIC. Watts' Revision of Fownes, revised by William A. Tilden. Philadelphia: P. Blakiston, Son & Co.

This is the latest revision of Fownes' Manual, in the department of organic chemistry. The main characteristics which distinguished the original work, orderly arrangement and clearness and conciseness of statement, are still maintained in the work as it is presented to-day, although the new matter successively added by Dr. Watts and Dr. Fisher often quite overshadows in importance that to be found in editions published before their work was added. Both volumes, physical and inorganic, and organic, are now published in uniform style, a large 12mo, of admirable typography.

PROTECTION OR FREE TRADE. By Henry George. New York: Henry George & Co.

The author of this book has risen rapidly to a considerable degree of public prominence, mainly on account of his radical ideas as to the unwisdom and injustice of the laws of all governments confirming and maintaining individual property in land. The present volume adds nothing to the intelligent discussion of protection *vs.* free trade, except as it seeks to connect the subject with these other ideas of the writer. In his view protection is a robber which may be driven off, but it is hardly worth while so long as there is a land owner left, for the latter is sure to take from labor all that it has but just sufficient to enable the continuance of work.

Received.

HOUSEHOLD REMEDIES. By Felix L. Oswald. New York: Fowler & Wells Company.

FOREORDAINED. A STORY OF HEREDITY. New York: Fowler & Wells Company.

CHEMICAL ARITHMETIC; WITH A SHORT SYSTEM OF ELEMENTARY QUALITATIVE ANALYSIS. By J. Milnor Coit. New York: D. C. Heath & Co.

Sugar Machinery for Plantations and Refineries forms the subject matter of a handsome illustrated catalogue just issued by Messrs. Robert Deeley & Co., of New York, engineers, founders, and machinists, who have for years made a specialty of this business. This firm has furnished the equipment for some of our largest sugar refineries, and has for an extended period enjoyed a large foreign trade in the furnishing of apparatus for plantations as well as for sugar factories.

Rock Drills, Air Compressors, and the machinery and appliances usually employed in connection therewith, are shown at considerable length in a recently published catalogue of the Rand Drill Company, of New York. The book has some instructive views showing the use of the drill in recent important engineering operations, with three pictures of the explosion last summer at Flood Rock, in the tunneling for which the Rand drill was used.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Wanted—Propositions from builders of ice machines, to erect a 25 ton machine for W. H. Howe, Nashville, Tenn.

Little and Lively.

The times change and we change with them. Hardly larger than mustard seeds, but composed of highly concentrated vegetable extracts, Dr. Pierce's "Pleasant Purgative Pellets" have caused the old style, large drastic, cathartic pills to be abandoned by all sensible people. The little sugar-coated Pellets are a sure cure for constipation; for persons of sedentary habits they are invaluable. They are little and lively, pleasant and safe.

Veneer Machines, with latest improvements. Farrel Fdry. & Mach. Co., Ansonia, Conn. Send for circular.

Haswell's Engineer's Pocket-Book. By Charles H. Haswell, Civil, Marine, and Mechanical Engineer. Giving Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, Architecture, Masonry, Steam Vessels, Mills, Limes, Mortars, Cements, etc. 900 pages, leather, pocket-book form, $4.00. For sale by Munn & Co., 361 Broadway, New York.

Wanted—A capitalist to take a half interest in or to manage a valuable patent on Automatic Freight Car Brake. A splendid chance to the right man. For further particulars, address R. B. V., Box 607, Iowa Falls, Iowa.

Send to the *Railroad Gazette*, 73 Broadway, New York, for a catalogue of Locomotive, Track, and other railroad books.

Emery Wheels of unusually superior quality for wet grinding. The Tanite Co., Stroudsburg, Monroe Co., Pa.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Pumps for liquids, air, and gases. New catalogue now ready.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. $100 "*Little Wonder.*" A perfect Electro Plating Machine. Sole manufacturers of the new Dip Lacquer Kristaline. Complete outfit for plating, etc. Hanson, Van Winkle & Co., Newark, N. J., and 92 and 94 Liberty St., New York.

Send for catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

The Knowles Steam Pump Works, 44 Washington St., Boston, and 93 Liberty St., New York, have just issued a new catalogue, in which are many new and improved forms of Pumping Machinery of the single and duplex, steam and power type. This catalogue will be mailed free of charge on application.

Machinery for Light Manufacturing on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Iron Planer, Lathe, Drill, and other machine tools of modern design. New Haven Mfg. Co., New Haven, Conn.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN patent agency, 361 Broadway, New York.

Curtis Pressure Regulator and Steam Trap. See p. 142.

Grimshaw.—Steam Engine Catechism.—A series of thoroughly Practical Questions and Answers arranged so as to give to a Young Engineer just the information required to fit him for properly running an engine. By Robert Grimshaw. 18mo, cloth, $1.00. For sale by Munn & Co., 361 Broadway, N. Y.

Timber Gaining Machine. All kinds Wood Working Machinery. C. B. Rogers & Co., Norwich, Conn.

Packer Ratchet Drills are drop forged from Norway iron and bar steel. Billings & Spencer Co., Hartford, Conn.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Hoisting Engines. D. Frisbie & Co., New York city.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N.Y. See illus. adv., p. 350.

Hercules Lacing and Superior Leather Belting made by Page Belting Co., Concord, N. H. See adv. page 382.

Nystrom's Mechanics.—A pocket book of mechanics and engineering, containing a memorandum of facts and connection of practice and theory, by J. W. Nystrom, C.E., 18th edition, revised and greatly enlarged, *plates*, 12mo, roan tuck. Price, $3.50. For sale by Munn & Co., 361 Broadway, New York city.

Iron and Steel Wire, Wire Rope, Wire Rope Tramways. Trenton Iron Company, Trenton, N. J.

Astronomical Telescopes, from 6" to largest size. Observatory Domes, all sizes. Warner & Swasey, Cleveland, O.

Cushman's Chucks can be found in stock in all large cities. Send for catalogue. Cushman Chuck Co., Hartford, Conn.

Supplement Catalogue.—Persons in pursuit of information of any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) C. E. De P. asks: 1. How many Edison lamps will the dynamo described in SUPPLEMENT, No. 161, run? A. One or two very small incandescent lamps. 2. If I were to make a machine double the size of the one described, should I use the same sizes of wire, and how much, and would it supply as many lamps as the first one? A. In a general way, use wire of double diameter and six to eight times the weight. It would require three or four times the power to run it, and would supply three or four times as many lamps. 3. How large a machine would it take to run six 16 candle lamps, and how much power would it require? In making a machine for this purpose, is there some better form of armature and commutator which I might use, and would I want to use the same sizes of wire as on the other machines? A. It would take about 1 horse power. It would not be advisable to construct so large a machine on the plan given. The drum armature (Siemens) is preferable. We cannot prescribe the exact size of wire, as it varies with the proportions of the machine.

(2) J. D. asks: How is dynamite that is used in the present time made? A. By mixing infusorial earth with nitro-glycerine. A recent proportion is 1 of earth to 3 of nitro-glycerine.

(3) G. J. asks how he can find any number of points in a circle without going around the circle with compass. A. Using the radius of a circle as chord, the circumference can be divided into six parts. This gives three parts, and by halving the sides, twelve; then by taking three sides of the dodecagon at once, it gives four parts; by doubling the dodecagon it gives 24 parts, etc. But for most of the ordinary cases, the tentative method is most available.

(4) L. E. C. asks (1) why secondary wire (of induction coil described in SUPPLEMENT, No. 160) is wound in two sections, with insulated wire drum between them. A. To more perfectly insulate from each other members of the coil possessing great difference of potential. 2. If No. 28 wire would not be better for medical purposes? A. We would not advise you to depart from proportions given. They have proved very good. Almost any proportion of parts will answer for a medical coil.

(5) A. T. G. asks: 1. Is 16 pounds of ice placed in a refrigerator every other day more serviceable than 8 pounds placed in it daily? A. The sixteen pounds would be the better if the refrigerator was not to be opened; normally, there would be no difference between them.

(6) E. J.—To paint on glass, take clear resin 1 ounce; melt in an iron vessel, let cool a little, but not harden; then add oil of turpentine sufficient to keep it in a liquid state. When cold, use it with colors ground in oil.—The following is a receipt

© 1886 SCIENTIFIC AMERICAN, INC

for a liquid which will remove ink from paper: Take of chloride of lime 1 pound, thoroughly pulverized, and 4 quarts soft water. The above must be thoroughly shaken when first put together. It is required to stand 24 hours, to dissolve the chloride of lime; then strain through a cotton cloth, after which add a teaspoonful of acetic acid (No. 8 commercial) to every ounce of the chloride of lime water. The eraser is used by reversing the pen holder in the hand, dipping the end of the pen holder in the fluid, and applying it, without rubbing, to the word, figure, or blot required to be erased. When the ink has disappeared, absorb the fluid with a blotter.—See SCIENTIFIC AMERICAN SUPPLEMENT, No. 438, for information about gelatine copying pad or hektograph.

(7) G. R. L. asks how to prepare a wash suitable for coloring an external wall a dark terra cotta tint. A. A wash for external work, said to be good, is formed in the following manner: Slake a shovelful of good lime in about a quart of warm blood, fresh from the slaughter house. Place in ordinary pail, and add a sufficient quantity of skim milk and beer grounds, boiled together, to fill the pail. Well stir the mixture, which will then be ready for use without the addition of water, and will stand the weather as well as oil paint. Another reported wash of excellence is formed by mixing one gallon of lime slaked with one gallon of wood ashes, ¼ pound of powdered alum or borax, and sufficient soft water to render the mixture of the consistency of cream. Color may be added to suit; 15 pounds of whiting and half a pound of fresh slaked lime, dissolved in skim milk, makes another hard and durable wash. To produce a terra cotta color, add 1 part of Indian red, 1 part of common lamp black, 3 parts of umber, and 1 to 2 parts of yellow ocher or chrome yellow, varying the quantity of the latter until the desired tint is obtained.

(8) C. S. M. asks how to make an ink that will not appear on paper unless the paper is heated. A. Dissolve 1 fluid ounce common oil of vitriol in a pint of soft water. Stir well, and allow it to cool. Write with a clean pen. When dry, it will be invisible; held to the fire, it turns black.

(9) H. K. writes: A railroad train starting at the equator on a railroad running north, which rail wears the faster—east or west; and on which side would a train be most likely to run off the track? A. The east rail would have the greatest pressure, from the earth's motion, and if the train was running fast enough, it would be thrown off on east side.

(10) Inquirer asks: 1. How can white country flannel shirts and drawers be washed without shrinking? Have hundreds to wash every two weeks, and the shrinkage soon renders the shirts too small for use. A. Care in rubbing and in the drying, after washing in tepid water, such as comes from experience, will make the shrinkage as little as possible, but the only sure way to insure such garments keeping their size is to dry them on forms, as do all the manufacturers of knit underwear. 2. What ingredients will form a wash to clean a brick church, now almost black, after 20 years' exposure in south side Pittsburg smoke? A. You will find the necessary information for cleaning brick walls in SCIENTIFIC AMERICAN SUPPLEMENT, No. 21. 3. Can you give a poor sufferer from asthmatic and bronchial ailments a remedy? A. There is a long and very explicit article on "Bronchial Asthma" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 171, by John C. Thorowgood, in which he gives several of his remedies.

(11) Y. F. writes: If a steamer makes 8 miles per hour carrying 90 pounds of steam, with 150 pounds will she not increase her speed to 12 miles? A. If the boat has good lines for speed, possibly adding 60 per cent to the steam pressure, with capacity of supply for the 50 per cent increase in speed of engine, will give the boat a speed of 10 miles per hour. The slip of a wheel, paddle, or screw increases with the increase of speed. 2. What is the hottest steam used for driving an engine, and will steam, when too hot, become valueless? A. Steam has been used for power up to 500 and more pounds pressure. It becomes only valueless by burning packing and oil. The pressure may be carried up to a thousand pounds.

(12) A. S. asks: 1. Is there any means by which to give very small wooden globules a permanent black or brown color, simply putting them in the solution? A. Wash with a concentrated aqueous solution of extract of logwood several times; then with a solution of acetate of iron of 14° B., which is repeated until a deep black is produced. 2. Where and for what price a square foot could I buy thin sheet lead to protect a table against acids? A. It is worth about ten cents per pound, and can be procured from a dealer in chemical apparatus.

(13) J. T. asks why the free silver on a silver print is removed when immersed in a soda bath (hyposulphite of soda), while that which is exposed to light is not. A. Sensitized paper is covered with albumen impregnated with chloride, and sometimes other haloid salts of silver. By exposure to the light these silver salts are reduced. Exposed under a negative, parts of the surface are protected from the action of light. When such a print, after exposure under a negative, is immersed in hyposulphite of soda, the silver chloride, etc., that light has not reduced is dissolved; the rest, by reduction, has been rendered insoluble in hyposulphite, and remains on the paper, constituting the print, which is ready for toning. There is no free silver in the print. The "hypo." removes the silver salts that have been unacted on by light. 2. Why do objects appear right side up to the senses, when they appear inverted on the retina of the eye? A. Presumably by experience and habit. Perception of distance is due to parallax, or distance apart of the eyes. 3. For solders and soldering see SUPPLEMENT, No. 20.

(14) E. E. B. asks (1) how to make a solution for silver plating, to be applied with a sponge or flannel to brass or copper. A. You can make solution for silver plating on brass, etc., by dissolving 1 ounce of nitrate of silver in 1 quart of rain or distilled water, and a few crystals of hyposulphite of soda are added which form a brown precipitate soluble in a slight excess of hyposulphite. Articles may be silvered by dipping a sponge in the solution and rubbing it over the surface of the article to be coated. 2. How to divide a circle into 360 parts. A. This is generally accomplished by means of a protractor, costing from 25 cents upward, which can be procured from any dealer in mathematical or drawing instruments.

(15) A. F.—The red coloring matter in thermometers is simply an aniline red dissolved in alcohol.

(16) W. J. S. asks the composition and mode of manufacture of the so-called "grease paints" used by actors in making up. A. The principle is to make a dry powder somewhat darker than the desired tint, and then thoroughly mix this powder with some bland oil (as almond oil) or some fat (as perfumed benzoated lard) or some perfumed paraffinoid (as petrolatum), in the proportion necessary to produce the required color and consistency.

(17) H. G.—Water will filter through a brick partition. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 451, on Filtering Cisterns.

(18) W. E. D. asks the process of casting bass relief tiles in bronze. A. The mould is made in sand from a pattern in the same manner as for ordiuary brass work. For special description of bronze casting see SCIENTIFIC AMERICAN SUPPLEMENT, No. 101, and for finishing bronze work see SCIENTIFIC AMERICAN SUPPLEMENT, No. 39.

(19) C. G. A.—The high polish on steel is produced by using Vienna lime on the buff.

(20) J. W. C.—Riveted joints should always be calked. Tubes should be expanded to stop leaks. Iron borings sifted and made into a putty with Prince's metallic paint, white lead, and boiled linseed oil make a good joint for flanges. Joints that leak water will also leak steam, however small.

(21) W. M. asks how to stain brass black; can it be done with fire or acids? It should be a dull black if possible. A. The best means for producing a black surface on brass or silver is said to be platinum bichloride, made by dissolving platinum in nitrohydrochloric acid to saturation. Dip the polished work or rub the solution on with a small pad of cotton. After blacking, the object is washed and lacquered.

(22) W. H. B. asks how the roughness is made, like file cuts, as on the triggers of guns at the part where your thumb raises the trigger. A. The parts are indented with a dull cold chisel in the manner of file cutting. The sharp edges are smoothed off in finishing.

(23) E. A. Y. asks what is the cement used for putting on stained glass substitute. A. Nothing but the best fish glue is used.

(24) H. T. writes: I have a double convex crown object glass, 3 inches diameter, 36 inches focus. What kind, and what focus, should the eye glass be, so the object will be seen erect, and in a natural position? A. For your eye glass use a concave lens of 3 inches or 4 inches negative focus. The 3 inch will give you a magnifying power of 12; the 4 inch a power of 9, making objects erect.

(25) G. M. W. desires (1) a receipt for preventing rust on the spokes of a bicycle. A. Boiled linseed oil will keep polished metals from rusting if it is allowed to dry on them. 2. How to brighten the nickel plating? A. Use a little rouge powder on a chamois skin.

(26) F. G. V.—Flowers may be preserved for many months by dipping them carefully, as soon as gathered, in perfectly limpid gum water; after allowing them to drain for two or three minutes, arrange them in a vase. The gum forms a complete coating on the stems and petals, and preserves their shape and color long after they have become dry.

(27) G. I. asks: 1. What is ammonia used for in a nickel solution (double sulphate)? A. The double sulphate of nickel and ammonium has been found to be the best salt from which nickel can be deposited. The ammonia which it contains is held in chemical combination. 2. How to make oroide plating solution? A. This variety of gold is a mixture of several metals, and we know of no means by which it can be used as a solution to plate with. 3. How to make hydrous carbonate of copper? A. By adding sodium carbonate in excess to a solution of copper sulphate. The resulting precipitate on being warmed assumes a green tint. 4. Is there any difference between hydrated and hydrous carbonate of copper? A. No. 5. A receipt for black color on bronze or brass? See answer to query 21.

(28) G. R. S. desires a recipe for a safe effectual depilatory. A. The safest depilatory is a strong solution of sulphide of barium made into a paste with powdered starch. It should be applied immediately after it is mixed, and allowed to remain there five or ten minutes.

(29) J. B. H. asks the number of miles of railroad in the world. A. 294,071. 2. An easy way of preserving flowers so they will retain their colors. A. See answer to query 26.

(30) P. J. O'C.—Small cupolas have been made and used for iron castings, using 300 to 500 pounds to a melting. They require experience in their management, and are not economical. It is also more difficult to make the castings of even grade in small cupolas.

(31) B. P. asks how to make porcelain glass or opal glass. A. Hot cast porcelain as manufactured in Pittsburg consists of:

Silica	67·19 per cent.
Cryolite	23·84 "
Zinc oxide	8·97 "

It is a milk white glass obtained by melting the above constituents together.

(32) E. M. B. asks: What pressure per square inch will compressed air give, say of three atmospheres, and what is the ratio of increase? A. The atmospheric pressure is 14·7 pounds. Each additional atmosphere adds the original pressure, thus 3 atmospheres is 44·1 pounds per square inch.

(33) F. W. D. writes: I have frequently observed in the West Indies, a little after sunset, large bands of light emanating from the spot where the sun had just set, widening in approaching the zenth, thence narrowing to a focus on the eastern horizon, where they sometimes seemed to terminate in a mock sun. A. This phenomenon is common in more or less intensity in all parts of the world. It is caused by clouds of various forms at or below the horizon intercepting the sunlight. The bands of light shining through broken clouds illuminate the air in streamers, sometimes reaching entirely across the sky, forming what appears to be diverging and converging rays in opposite horizons. These rays are really straight, and owe their apparent curved forms to the laws of perspective.

(34) S. S. asks whether or not a boiler will evaporate more pounds of water per pound of fuel used when water is kept high than when kept low in boiler. A. A boiler with high water will lose more water by vesicular admixture with the steam, or, in other words, will work wet steam. Low water makes dry steam unless the boiler is overworked. Dry steam makes its best work per pound of coal, and is accomplished at the low water line. This should always be a safe line.

(35) M. P. P. asks a recipe for blackening the interior of telescope tubes—something thin, smooth, and dead black. A. Use lamp black or ivory black, rubbed up with 95 per cent alcohol. Then add a few drops of shellac varnish, just enough to make the lamp black adhere without gloss. Spread quickly with a flat camel's hair brush, or in small tubes with a feather or swab.

(36) C. S. L.—Oil paintings that are freshly painted can be removed from the canvas by the application of a solvent, such as equal parts of alcohol and spirits of turpentine. If the paint is old and hard, the canvas can only be utilized by covering the painting with several coats of white lead and Naples yellow.

(37) F. C. C. asks about replating a revolver and erasing an engraved name therefrom. A. You can cut out the engraved space with a small chisel like a shallow mortise, and fit a piece of iron or brass in the space and tin it in. Then finish off the surface and replate the whole. If you undertake to fill up the space with tin or solder, it will not take the plating evenly, and will show the spot after plating.

(38) G. F. K. writes: I am making a tool, part of which must be magnetic; what steel is best, also what temper is best, to magnetize same? A. Ordinary tool steel. Double shear steel is better. Harden at a cherry red, and draw to a straw color for magnets. Magnetize by contact with a strong magnet or electro magnet.

(39) A. M. asks: What kind of sizing and varnish is used to obtain the best gloss on maps, cards, etc.? A. The following is an excellent receipt for map varnish: Canada balsam and clear white resin, of each 6 ounces, oil of turpentine 1 quart; dissolve. Apply with a brush.

(40) R. L. desires a formula for making a prepared glue hat will repair all kinds of articles and always be ready for use. A. Dissolve 8 ounces best glue with ½ pint of water, and add slowly 2½ ounces strong aqua fortis (nitric acid), 36° Baume, stirring all the while. Keep well corked.

(41) J. A. M. asks how to make corks airtight besides covering them with tin caps. A. Dip the top of the corked bottle in melted paraffine or melted beeswax before putting on the cap.

(42) E. C. F. asks (1) if peroxide of hydrogen is the best blondine. A. The best we know of. 2. Is it perfectly harmless? A. It is a poison. 3. Is it used diluted; if so, to what extent can it be diluted? A. It is diluted. A ten per cent solution might be used. 4. How many applications does it require, and will the color vary from dark to very light in proportion, and how lasting the shade? A. It should be applied in rather small quantity and in successive applications until the right color is reached. The shade is permanent, but, of course, as the hair grows the original color will show at the roots, and extend upward with the growth of the hair.

(43) W. C. H. asks: 1. How can I finish and polish buffalo horns nicely? Is it best to use varnish? A. With sand paper of increasing fineness, and finish with ground pumice stone and water. 2. Can hydrogen gas be safely and economically used in an oxy-calcium stereopticon fitted for burning house gas? A. It can be, but with increased liability to snap back. 3. What candle power does a No. 2 kerosene burner give when trimmed so as to give its best light and using 150° fire test oil? A. 6 to 8 candles. 4. In a bichromate plunge battery, does the E. M. F., or the quantity of current, decrease as the battery runs down? A. The E. M. F. runs down quite rapidly. 5. Will a sufficient number of such cells maintain an electric light for a reasonable length of time, say 2 to 3 hours, without change of solution or cleaning plates? A. They will.

(44) E. F. F. asks he how can make chloride of gold, such as photographers use, out of a gold dollar. A. Boil in hydrochloric acid, dropping in from time to time nitric acid. When completely dissolved, evaporate down until the acid gives off but little odor, and dilute after cooling.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined with the results stated.

B. F. P.—The mineral is selenite (hydrous sulphate of lime), when ground, it is used as a fertilizer. When burned and ground, it is the so-called plaster of Paris. It is worth in New York about $2.85 per long ton.—G. W.—No. 1 contains pyrite and magnetite. No value. No. 2. Pyrite; no value.—M. M. K.—The specimen is limestone and not likely to contain anything of value.—C. H. La P.—The mineral is pyrite (sulphide of iron). It has no value.—S. K B.—The specimens are not gold, but simply mica, and of no value.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

June 1, 1886,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Acid, manufacture of sulphuric, U. Cummings.... 342,785
Addressing machine, J. A. Truesdell.... 343,091
Air compressor, hydraulic, E. M. Hugentobler.... 342,798
Animal assorting device, C. F. Shedd.... 342,977
Axle cutter, R. D. McGee.... 343,058
Axle lubricator, car, F. G. Brownell.... 343,004
Baby jumper, swing, and reclining chair, combined, Abbey & French.... 342,855
Baby walker, A. Halstenbach.... 343,026
Bag or portmanteau, O. Seefels.... 343,073
Bearing, ball, W. H. Wright.... 342,891
Beer, apparatus for the preservation of, Hazlet & Bennett.... 343,125
Bell ringer, E. G. Nutting.... 343,059
Belting, coupling for round, D. C. Smith.... 342,850
Berth, automatic ship's, J. B. Secor.... 343,072
Bicycle, D. H. Rice.... 342,878
Bicycle saddle, J. Payne.... 342,925
Binder, temporary, W. D. Ready.... 343,066
Blacking box, C. H. Jackson.... 343,083
Blast heating oven, air, E. Peckham.... 343,061
Blotter, revolving, J. A. Cook.... 342,781
Board. See Ironing board.
Boiler furnace, E. J. C. Kelly.... 343,128
Book holder, L. M. Snyder.... 343,085
Boot, felt, D. F. Messer.... 343,135
Boot or shoe, F. Moor.... 342,806
Boot or shoe heel, J. H. Peters.... 343,062
Boot or shoe sole, L. E. Moore.... 343,051
Boot, quarter, J. H. Fenton.... 342,790
Boots, shoes, and stockings, process of and apparatus for making felt, O. E. Wallace.... 342,943
Bottle, medicine, B. G. Olson.... 342,837
Bottle wrapper, C. G. Biedinger.... 342,818
Bows or neckties, combined spring fastener and shield for, W. Dewart.... 342,862
Box. See Blacking box. Fare box. Musical cigar show box. Stuffing box.
Box nailing machine, F. W. Edwards.... 342,788
Box strap, R. G. Valentine.... 342,942
Bracket. See Lamp bracket.
Brake. See Railway brake. Vehicle brake.
Brick kiln, O. O. Phillips.... 342,926
Brooder, W. F. Price.... 343,064
Buckle, M. Vandercook.... 342,984
Buckle, M. E. Zeller.... 343,097
Buckle for saddles, S. T. Butler.... 343,005
Buckle, trace, J. Fischer.... 343,118
Burnishing machine, H. Crary.... 342,783
Butter, apparatus for testing, L. Fagersten.... 342,865
Calculator, G. F. Hawley.... 342,796
Calendar, perpetual dial, C. R. Talcott.... 342,981
Camera plate holder, L. Koss.... 342,914
Can. See Powder can.
Car coupling, J. A. Craig.... 343,109
Car coupling, T. Diemer.... 342,825
Car coupling, S. Haltom.... 342,793
Car coupling, L. A. Houghtaling.... 342,797
Car coupling, W. B. Little.... 342,967
Car coupling, M. Spelman.... 343,086
Car coupling links, machine for bending and welding, J. D. Bowman.... 342,858
Car starter, Hansen & Fischer.... 342,959
Car starter, S. Rockafellow.... 342,846
Car starter and brake, J. W. & G. R. Strickle.... 343,144
Carbureting air or gas, apparatus for, C. B. Dudley.... 342,863
Card feeding mechanism, etc., endless metallic apron for, W. C. Bramwell.... 342,948
Card receiver, outside, A. Moore.... 343,050
Carding horse hair, machine for, L. Zaller.... 342,945
Carrier. See Cash and parcel carrier.
Cart, hand, J. R. Fitzhugh.... 342,905
Case. See Map case.
Cash and parcel carrier, D. W. Miller.... 342,921
Caster, furniture, S. H. Raymond.... 342,930
Caster holder for furniture, C. E. Ongley.... 342,970
Cement, manufacture of, U. Cummings.... 342,784
Chair. See Children's chair.
Chair and table, convertible, C. E. Schleier.... 342,847
Chair bottoms, manchine for caning, J. S. Hodgson.... 342,963
Chairs, adjustable head rest for, J. Hogan.... 342,880
Chickens of the gapes, device for curing, R. B. Walker.... 343,145
Child's chair, F. A. Parker.... 342,841
Chopper. See Cotton chopper.
Churn, L. Doell.... 343,016
Churn dasher, J. R. Palmer.... 342,839
Churning device, J. S. Dickey.... 343,015
Cigar lighter, J. M. King.... 342,913
Clamp. See Dam clamp.
Clasp, C. C. Shelby.... 342,987
Clevis, G. F. Walter.... 342,887
Clod crusher and land marker, combined, A. Bartmes *et al.*.... 342,995
Clod crusher and pulverizer, C. C. Marchand.... 343,046
Clothes rack, W. H. Ertell.... 342,954
Coal breaker, G. R. Root.... 342,811
Cock, automatic cylinder, Maines & Nugent.... 342,801
Coffee roaster, E. E. Mueller.... 342,834
Collar pad attaching device, horse, E. P. Robbins. 342,981
Combination lock, H. C. Griffin.... 342,958
Compression roll for slashers, etc, expanding, G. P. Whitman.... 342,889
Condensing and cooling apparatus, H. Hocking.... 342,871
Cooling and refrigerating apparatus, E. Kauffeld.. 343,035
Core material, W. N. Gartside.... 342,906
Corn husker, D. T. Phillips.... 342,807
Cotton chopper, W. H. Richardson.... 343,140
Coupling. See Car coupling. Hose coupling.
Crusher. See Clod crusher. Rock crusher.
Cultivator and corn planter, combined, J. R. Gilliland.... 342,791
Cutter. See Axle cutter. Feed cutter. Finger nail cutter. Knee cutter. Rope cutter. Thrashing machine band cutter.
Desk, T. Little.... 343,041
Desk and bureau or other piece of furniture, combined writing, H. Stolte.... 342,883
Digger. See Post hole digger. Potato digger.
Door, combined storm and screen, A. Lloyd.... 342,832
Drawing roll and saddle therefor, top, E. J. Carroll *et al.*.... 342,779
Drop light and chandelier, J. Trigge.... 342,982
Electric cable, multiple, J. J. C. & M. Smith.... 343,082
Electric cables, making, J. J. C. & M. Smith.... 343,081

© 1886 SCIENTIFIC AMERICAN, INC

Electric cables, manufacture of, J. J. C. Smith.... 343,083
Electric conductors, manufacturing, E. G. Acheson.... 343,099
Electric conductors, vulcanizing the insulating covering of, M. Smith.... 343,084
Electric lights, house wiring for, Stieringer & Vail.... 343,087
Electric machine, dynamo, A. G. Ketchum.... 343,129
Electrical distribution, system of, T. A. Edison... 343,017
Electricity, conductor of, E. G. Acheson.... 342,892
Elevator. See Wagon box elevator. Water elevator.
Elevator boot, C. Esplin.... 342,955
Engine. See Pulp beating engine. Steam engine.
Envelope sealing apparatus, B. F. Brown.... 342,821
Eraser and pencil holder, rubber, J. Cain.... 343,007
Fare box, portable, Friede & Johnston.... 343,120
Faucet, water, L. E. Clark.... 343,106
Feed cutter, J. Buck.... 342,859
Feeding salt or compressed feed to cattle, device for, Thompson & Lee.... 342,885
Fence, G. A. Cooke.... 343,107
Fence post, S. J. Munn.... 342,922
Fiber from fiber plants, manufacture of, H. R. Randall.... 342,843
Fiber plants or material for the production of fibers, apparatus for treating, H. R. Randall... 342,842
Fifth wheel, R. M. & W. J. Lawrence.... 343,039
File, E. A. Kittell.... 342,831
File F. D. Moore.... 343,136
Filling machine, turn over, Bratby & Chadwick.. 343,001
Finger nail cutter, G. H. Coates.... 342,780
Firearm, breech-loading, D. M. Lefever.... 343,040
Fire escape, D. P. Barrett.... 342,856
Fire escape, G. W. Putnam.... 342,810
Fire escape ladder, A. O. Nordenborg.... 342,924
Fire escape, portable, J. B. Bray.... 342,820
Fire kindler, F. L. Stewart.... 342,814
Fireplace, A. T. Bennett.... 342,776
Fishing tackle, G. Ritter.... 342,814
Floor washer, B. Fernandez y Rabeiro.... 343,019
Flushing tank, A. Rosewater.... 343,069
Fruit basket cover, F. Springhorn.... 342,851
Furnace. See Boiler furnace. Gas furnace. Heating furnace.
Furnace for melting metal in crucibles, gas, H. H. Garrett.... 343,122
Furniture spring, O. S. & W. S. Foster.... 343,022
Furniture, woven cord, L. P. Nelson.... 342,836
Game apparatus, F. P. Stiker.... 343,088
Gate. See Railway gate. Water gate.
Gearing, B. D. Whitney.... 343,094
Generator. See Steam generator.
Glass, iron, etc., gas furnace for melting, L. Whittaker.... 342,844
Glass, etc., machine for grinding, Seyer & Richard.... 342,935
Glassware, manufacture of opalescent, Leighton, Jr., & Russell.... 343,133
Glassware, manufacture of variegated, D. Challinor.... 342,898
Glove, Mays & Pepys.... 342,833
Grader, road, A. V. Pitts.... 342,808
Grain binder, H. E. Pridmore.... 343,152
Grain meter, automatic, E. N. Williamson.... 342,854
Grater, M. Schaible.... 343,141
Harrow, disk, C. La Dow.... 343,132
Harvester, W. R. Baker.... 343,147
Harvester, R. Brown.... 343,002
Harvester, H. & J. H. Smith.... 343,078
Harvester, grain, W. F. Olin.... 342,969
Harvester wheel, W. R. Baker.... 343,148
Hay knife, W. H. Gaines.... 342,957
Hay rake, horse, C. La Dow.... 343,131
Heating furnace, Felty & Floyd.... 342,904
Heel nailing machine, A. Davis.... 342,786
Holder. See Book holder. Camera plate holder. Rein holder. Tag holder. Whip and rein holder.
Hook. See Snap hook.
Hop press, A. Meyer.... 342,805
Horse blanket, C. H. Magoon.... 342,800
Horses, feed bag for, E. Dawson.... 342,951
Horses, stall for handling vicious, C. F. Shedd.... 342,976
Horseshoe, J. P. Dudley.... 343,115
Hose coupling, Symes & Buchtel.... 343,089
Hose spanner, F. B. Munroe.... 342,923
Hosiery, manufacturing, Borton & Willcox (r).... 10,730
Ice shaver grip, I. C. Souders.... 342,813
Incubators, etc., automatic regulator for, P. C. Morse.... 343,053
Induction coil, A. M. A. Beale.... 342,947
Ingot mould, Matthes & Lash.... 342,920
Injector, steam, W. Penberthy.... 343,139
Ironing board, F. G. Manley.... 343,045
Jack. See Wagon jack.
Joint. See Rail joint.
Jump seat, G. H. Hutton.... 342,964
Kiln. See Brick kiln.
Knee cutter, T. C. Belding.... 343,100
Knife. See Hay knife. Shoemaker's knife.
Knitting machines, stop motion for, J. Byfield.... 342,823
Lacing bearing, E. R. Spencer.... 342,940
Lacing bearing, J. C. Wilson.... 343,146
Ladder, sectional, J. T. Hartwell.... 342,909
Lamp, W. Duffield.... 342,826
Lamp, D. H. Murphy.... 343,137
Lamp bracket, H. E. Bemis.... 342,997
Lamp, regenerative gas, Scotchmer & Young.... 343,142
Lamp, spring balance, E. H. Wheeler.... 343,093
Lantern, C. E. Meier.... 343,048
Lathe for turning crank axles, attachment for, W. Beers.... 342,895
Lathe, tubular cutter, R. G. Burleigh.... 342,822
Leather rolling machine, C. S. Ames.... 342,946
Leather splitting machines, knife for, G. L. Tyler 342,983
Life raft, C. J. Hendry.... 343,028
Lock. See Combination lock. Nut lock.
Loom for weaving tufted fabrics, Crompton & Wyman.... 343,013, 343,110 to 343,118
Lubricator. See Axle lubricator.
Lumber cutting machine, H. S. Smith.... 342,939
Magnets, device for controlling the movements of the armatures of electro, C. L. Clarke.... 343,008
Map case, S. E. Nutting.... 343,060
Measuring electric currents, apparatus for, P. Cardew.... 342,777
Meter. See Grain meter.
Mill. See Grinding mill. Roller mill. Windmill.
Mould. See Ingot mould.
Moulds, flask weight for, A. Smith.... 342,882
Motors, electrical stopping device for, Leigh & Townend.... 342,872
Mower and reaper knives, grinding machine for, E. H. Fenton.... 342,789
Mower, lawn, C. W. Cheney.... 342,900
Music boxes, zither attachment for, A. Sueur.... 342,979
Musical cigar show box, A. Ward.... 342,986
Musical instrument, mechanical, F. E. P. Ehrlich. 343,116
Nail making machine, F. F. Raymond, 2d.... 342,929
Neckties, scarfs, etc., fastener for, C. C. Shelby... 342,936
Needle, E. A. Bailey.... 342,773
Nut lock, J. Bare.... 342,994
Ore crusher, M. Hoagland, Jr.... 342,870
Organ, pipe, M. P. Moller.... 343,049
Packing for valve stems and piston rods, F. G. Brownell.... 343,003
Packing, piston, W. A. Boyden.... 342,819
Packing, piston, T. B. Purves.... 343,065
Paper fabric, making, C. P. Wyman.... 342,988
Paper from bark, manufacture of, J. M. Allen.... 342,991
Parasol or umbrella, J. T. Smith.... 343,079, 343,080
Pavements, stamp or die for cement, C. Sutton.... 342,980
Paving, roofing, and building compound, A. Walrath.... 342,852
Pencils, erasive guard for writing, W. K. Foster.. 342,956
Perch for fowls, I. J. Baxter, Jr.... 342,894
Percolator, J. Berry.... 342,998
Picture exhibitor, P. Klemann.... 343,130
Piston for steam cylinders, balanced, T. Joyce.... 342,966
Plow, J. B. Brown.... 342,896
Plow, sulky, S. Rockafellow.... 342,845
Plow, sulky, C. Russ.... 343,071
Post. See Fence post.
Post hole digger, L. Y. Myers.... 342,835
Potato digger and coverer, C. F. Plumb.... 343,063
Powder can, H. H. Hull.... 343,126
Press. See Hop press.
Printer's case stand and galley tray, N. C. Hawks. 342,795
Printing machine, cylinder, J. T. Hawkins.... 343,027
Pulley, H. T. Farnsworth.... 343,013
Pulley, M. McAleenan.... 342,804
Pulley, belt, W. J. Innis.... 342,910
Pulp beating engine, F. J. Marshall.... 342,802
Pump, beer, M. L. Deering.... 342,901
Punch and register, ticket, Thorpe & Richardson.... 343,090
Pyrotechnic throwing device, E. C. Bruen.... 343,103
Quilting machine, A. Hildt.... 343,029
Rack. See Clothes rack.
Rail joint, Guillaume & Fish.... 343,124
Railway brake, J. Kernaghan.... 342,799
Railway, electric, E. M. Bentley.... 343,101
Railway, electrical, S. H. Short.... 343,076
Railway gate, Jacobs & Houston.... 343,034
Railway points, etc., signal apparatus for, H. Johnson.... 342,911
Railway signal, Rosewell & Conger.... 343,070
Railway signal, automatic, J. J. Hamilton.... 342,908
Railway switch, frogless automatic, Morgan & Baker.... 343,052
Railway tie, Warner & Deakin.... 342,987
Railways, link cable for street, S. R. Mathewson.. 342,808
Reaper knife sharpener, J. Houghton.... 343,030
Regulator. See Watch regulator.
Rein holder, W. P. Tullock.... 343,092
Rein holder, V. Zevley.... 343,098
Ring. See Spinning ring.
Roaster. See Coffee roaster.
Rock crusher, J. O. Bosworth.... 342,999
Rock drill and well boring machine, W. C. Wells (r).... 10,731
Roller mill, O'Neil & Young.... 342,838
Rope cutter, J. R. Gallinger.... 343,121
Rubber dam clamp, F. Eschauzier.... 343,117
Saddle, gig, M. Schrand.... 342,848
Sandpapering machine, C. Roehr.... 342,932
Satchel frames, etc., fastening for, L. B. Prahar.. 342,974
Satchels, handle fastening for hand, L. B. Prahar.... 342,973
Sausage stuffer, Siereveld & Stallman.... 343,077
Saw, drag, W. H. Yagel.... 343,096
Saw guide, W. F. Parish.... 342,876
Sawmills, transfer apparatus for, G. W. Loggie.... 342,918
Sawing machine feed table, D. J. Murray.... 343,057
Scalper, R. Bing.... 342,857
Screw cutting machine, C. W. Bowden.... 343,102
Screwdriver, E. D. King.... 343,150
Seat. See Jump seat.
Settee, folding, N. J. Walsworth.... 342,886
Sewing machine, J. Kayser.... 343,036
Shells, machine for drawing metallic, J. S. Palmer.... 342,840
Shirt, S. Butz.... 343,006
Shoe, W. F. Maurer.... 343,047
Shoemaker's knife, W. L. Van Meter.... 342,985
Shoes, machine for slitting and preparing soles for turned, W. Wickersham.... 342,890
Shovel. See Snow shovel.
Shutter fastener, S. H. Haas.... 342,792
Signal. See Railway signal.
Signaling apparatus, automatic block, T. W. Burt. 342,860
Silver ores, working copperous, F. Ernst.... 342,903
Sled runner, bob, J. Moses.... 343,054
Sleigh body, W. Chase.... 342,899
Snap hook, harness, J. A. Park.... 342,877
Snow shovel, W. H. Hicks.... 342,961
Sodium and potassium, manufacture of, H. Y. Castner.... 342,897
Speculum, rectal, J. R. Hamilton.... 342,794
Spindle bearing, J. T. Meats.... 342,878
Spinning frame, ring, W. E. Sharples.... 343,074
Spinning machines, top roll saddle for, E. J. Carroll *et al*.... 342,778
Spinning ring, E. Leak.... 343,151
Spring. See Furniture spring. Vehicle spring.
Spring bending machine, J. W. Gray.... 343,123
Square, folding, A. E. Seltzer.... 342,849
Stand. See Printer's case stand. Washtub stand.
Steam engine, C. R. Crane.... 342,782
Steam generator, W. H. Page.... 342,875
Steam generators, section for, E. R. Bryant.... 343,104
Steamer or urn, coffee, J. S. Sanborn.... 342,879
Steel, R. Hadfield.... 342,867, 342,868
Steel, making, R. Hadfield.... 342,869
Stocking supporter, C. C. Shelby.... 342,938
Stone dressing apparatus, J. D. Brunton.... 342,861
Stove, heater, and furnace, T. Poore.... 342,809
Stove, heating, J. McMaster.... 342,968
Stove leg and caster, F. M. Hunting.... 343,031
Stove, vapor, M. L. Hull.... 343,127
Stoves, door for cooking, J. A. Price.... 342,928
Strap. See Box strap.
Stuffing box, H. Strater.... 342,815
Sugar, etc., apparatus for the manufacture of, J. A. Cook.... 343,108
Sulky stirrup, T. D. Aitken.... 342,772
Switch. See Railway switch.
Switch and signal apparatus, J. T. Hambay.... 342,907
Table. See Sawing machine feed table.
Tag holder, C. E. Ongley.... 342,971
Tap, W. Murchey.... 343,056
Tapping machine, Garvin & Hadley.... 342,866
Telegraph, automatic printing, E. J. Mallett.... 343,042
Telegraph, railway, C. W. Williams.... 343,095
Telegraphy, automatic, E. J. Mallett.... 343,043, 343,044
Telephone lines, preventing disturbances on, Dann & Lapp.... 343,014
Telephone repeater, induction, S. F. Shelbourne.. 342,881
Telephone transmitter, A. Beale.... 342,775
Thrashing machine band cutter and feeder, J. P. & W. D. Fleming.... 343,021
Threshold, device to be substituted for, C. M. Haven.... 342,829
Ticket, railway, W. A. Thrall.... 342,941
Tie. See Railway tie.
Tongs, W. H. Evans.... 342,827
Tongs, die for making blanks for pipe, Smith & Fawcett.... 343,155
Tongue, wagon, J. L. Hall.... 342,828
Tool, combination, J. A. Stone.... 342,884
Toy pistol, A. B. Austin.... 342,893
Traction wheels, lug for, Kennedy & Steward.... 342,912
Triturator, L. Sherman.... 343,075
Truck, hand, J. Caldwell.... 342,950
Truck, hand, C. W. Smith.... 342,978
Truck, stove, J. Thaxter.... 342,816
Tube expander, P. Fitzgibbons.... 343,020
Tug, spring draught, J. M. Rohrer.... 343,068
Twisters, etc., stop motion for, C. F. Alexander... 342,990
Type distributing machine, H. C. Leland.... 342,916
Valve indicator for steam engines, A. L. Ide.... 343,032
Valves, fitting for steam and other, J. G. Whitlock.... 342,853
Valves, muffler for steam, T. E. Hill.... 342,962
Vehicle brake, R. H. Sayre.... 342,933
Vehicle spring, W. L. Purple.... 343,153
Vehicle step, D. F. Winters.... 342,817
Vehicle top, V. A. Menuez.... 342,874
Vehicle, two-wheeled, Barber & Croft.... 342,993
Vehicle, two-wheeled, C. S. Beebe.... 342,996
Vehicle, two-wheeled, W. H. Long.... 343,134
Velocipede, C. S. Leddell.... 342,915
Velocipede, T. N. Petersen.... 342,972
Velocipede, J. H. Schulze.... 342,934
Ventilator, P. R. Addoms.... 342,989
Vise, pipe and rod, J. G. Baker.... 342,992
Wagon bodies, angular corner for, J. F. Roeking.. 343,067
Wagon box elevator and dump, W. Scarborough.. 342,880
Wagon chair and walker for babies, combined, I. C. Price.... 342,927
Wagon, dumping, H. C. Conkle.... 343,011
Wagon jack, W. T. Easterday.... 342,953
Wagon running gear, G. Delker.... 343,114
Walking stick and brush, combined, W. E. Coster 342,012
Warping machines, stop mechanism for, G. S. Follansbee.... 343,119
Washtub stand, H. Geisler.... 343,023
Washer. See Floor washer.
Watch pouch, M. Dooley.... 342,952
Watch regulator, N. J. Eddy.... 342,864
Watch springs, machine for treating metal ribbon for, J. Logan.... 342,917
Watch, stop, E. J. A. Dupuis.... 343,149
Water closet bowls, coupling for, T. McHugh.... 343,138
Water conductor, sheet metal, Gordon & Gilbert.. 343,025
Water conductors, machine for making sheet metal, Gordon & Gilbert.... 343,024
Water elevator, G. J. Mansfield.... 342,919
Water gate, J. M. Sanders.... 342,975
Weigher, automatic grain, E. Dickson.... 342,902
Weighing mechanism for wool and other fiber, W. C. Bramwell.... 342,949
Well tubes and poles, clamp for holding, B. Wheeler.... 342,888
Wheel. See Fifth wheel. Harvester wheel.
Whiffletree, L. L. James.... 342,965
Whiffletree attachment, L. C. Butch.... 343,105
Whip and rein holder, combined, Moulton & Coe. 343,055
Windmill, F. P. Bouteiller.... 343,000
Window fastening, L. C. Baldwin.... 342,774
Wire, apparatus for heating, E. Clifton.... 343,010
Wire for making and mending wire and picket fences, device for twisting, Hayner & Owens.. 342,960
Wire, machine for making barbed, C. D. Rogers.. 343,154
Wire stretcher, H. Clemons.... 343,009
Wool scouring machine, C. P. Smith.... 342,812
Wrench, J. K. Clark.... 342,824
Wrench, A. Langstrom.... 343,038
Yarns to the spindles on spinning jacks or mules in the operation of doffing, mechanism for clamping, W. F. Durgin.... 342,787
Yoke retainer, neck, J. H. Klinkner.... 343,037

DESIGNS.

Brooch or scarf pin, E. L. Logee.... 16,717
Clock stank, H. J. Muller.... 16,714
Glass vessel, W. A. Wood.... 16,720
Lace pin, E. L. Logee.... 16,718
Scarf pin, J. F. Morse.... 16,719
Spoon and fork handle, H. W. Hirschfeld.... 16,713
Type, H. Ihlenburg.... 16,715
Type, W. W. Jackson.... 16,716

TRADE MARKS.

Agricultural implements, J. Dunn.... 13,346
Anti-explosive compounds used in kerosene lamps and kerosene stoves, Heinrichs & Co.... 13,353
Bitters, D. Flannery.... 13,350
Cotton duck, J. Dunn.... 13,344
Cotton goods, Boott Cotton Mills.... 13,341
Coverlets and rugs of sheep's wool, camel's and other animals' hair, Greve & Uhl.... 13,352
Edge tools, J. Dunn.... 13,345
Gum, chewing, B. Ward.... 13,366
Hair nets, A. G. Jennings & Sons.... 13,354
Harmonicas, J. Rosenthal & Co.... 13,362
Laces for corsets and boots and shoes, Fletcher Manufacturing Company.... 13,351
Liniment, J. J. Six Dykstra.... 13,364
Liniment and leg wash, E. B. Johnson & Co.... 13,355
Lotion for the skin, H. A. Durrua.... 13,347
Medicinal preparation for purifying the blood, V. Polidori.... 13,359
Oil, cylinder, Vacuum Oil Company.... 13,365
Oils forming a balsam, combination of vegetable, B. Collins.... 13,343
Paints, oil, J. L. Rice.... 13,361
Paper, fine writing, S. Worthington.... 13,367
Perfumery and soap, Colgate & Co.... 13,342
Soap and soap powders, laundry and toilet, R. W. Bell Manufacturing Company.... 13,363
Starch, laundry, T. Kingsford.... 13,356
Teas, gunpowder, imperial, young hyson, Japan, Oolong, and English breakfast, Reid, Murdoch & Fischer.... 13,360
Thread, cotton, Les Fils de Cartier-Bresson.... 13,357
Tobacco and snuff, plug and fine-cut chewing and smoking, Eight Hour Tobacco Company.... 13,349
Tobacco and snuff, plug, fine-cut, and smoking, Eight Hour Tobacco Company.... 13,348
Toilet powder, J. Mulchahey.... 13,358

A Printed copy of the specifications and drawing of any patent in the foregoing list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 361 Broadway, New York. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, at a cost of $40 each. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

GET THE BEST AND CHEAPEST

J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States of the
CELEBRATED
PERIN BAND SAW BLADES,
Warranted **superior to all others in quality, finish, uniformity of temper, and general durability.** One **Perin Saw** outwears **three** ordinary saws.
Manufacturers of Planing Machines and other Patent Wood Working Machinery.

SEBASTIAN, MAY & CO'S
Improved Screw Cutting
LATHES Foot & Power

Drill Presses, Chucks, Drills, Dogs, and machinists' and amateurs' outfits. *Lathes on trial.* Catalogues mailed on application.
165 W. 2d St., Cincinnati, O.

REMOVAL OF SEWAGE.—BY W. H. White, C.E.—The five methods in use in Europe, and their relative values. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **527.** Price 10 cent. To be had at this office and from all newsdealers.

2d HAND MACHINERY Lists sent. N.Y. Machinery Depot, Bridge Store No. 16, Frankfort Street, N. Y.

STAMPED METAL GOODS,
and other Articles in Brass and other Metals (the Dies and Tools for making same). Patent Novelties, Electrical Inventions, Special Machinery, Castings, &c. Manufactured to order by M. MARTIN, Manufacturer, P. O. Box 285, New Brunswick, N. J.

Syracuse Malleable Iron Works

PORTABLE BRIDGES.—DESCRIPTION of a novel system of portable bridges devised by Mr. Alfred Cottrau, of Naples. Illustrated with 14 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **466.** Price 10 cents. To be had at this office and from all newsdealers.

Ingersoll Rock Drill Co.,
10 PARK PLACE, New York,
ROCK DRILLS,
Improved Stone Channeling Machines,
Gadders, Quarry Bars, Plug and Feather Drills, and general Quarrying Machinery.
Send for full descriptive catalogue.

THE DESIGNING OF ORDINARY
IRON HIGHWAY BRIDGES,
Illustrated by Numerous Engravings and 7 Folding Plates. Showing Bridges Actually Constructed, and Giving Their Dimensions; also containing 42 Tables. Price, $4.00. By J. A. L. WADDELL, C.E., B.A.Sc., M.A.E. The very complete index will prove of great convenience to both students and engineers, using the work as a book of reference. Address, MUNN & CO., 361 Broadway, New York.

Type setting, etc., easy by printed directions. For **business** or **home use** or money making. For old or young. Send 2 stamps for catalogue of **presses, type, cards paper etc. to factory.**
Card Press, $3. Circular Size, $8. Newspaper Size, $44.
KELSEY & CO., Meriden Conn.

UNILATERAL HALLUCINATIONS.—A paper by Dr. W. A. Hammond, treating of the unilateral hallucinations of sight and hearing. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **523.** Price 10 cents. To be had at this office and from all newsdealers.

BARREL, KEG,
Hogshead,
AND
STAVE MACHINERY.
Over 50 varieties manufactured by
Truss Hoop Driving. **E. & B. Holmes,**
BUFFALO, N. Y.

THE VACUUM AUTOMATIC BRAKE.—Full description of the apparatus, illustrated with 10 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **523.** Price 10 cents. To be had at this office and from all newsdealers.

SLATE ROOF COVERINGS.—BY JOHN Slater. Characteristics of good slate, sizes of slate, laying slate. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **498.** Price 10 cents. To be had at this office and from all newsdealers.

PERFECT
NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN.

AMERICAN STEAM BOILER INSURANCE CO.,
45 William Street, New York.
Write for Special Blanket Form No. 99; gives complete protection to property, and pays $5,000 for a life and $50 weekly for six months for injury.

Edco System
Of Arc and Incandescent Lighting.
Electric Light and Power.
Motors, Dynamos, Lamps, and Batteries in all varieties.
Electro-Dynamic Co., 724 Carter St., Philadelphia.
W. W. Griscom, Consulting Electrical Engineer.

© 1886 SCIENTIFIC AMERICAN, INC

Joshua Rose's Great Treatise on Steam Engines.

JUST PUBLISHED.

Modern Steam Engines.

An elementary treatise upon the Steam Engine, written in plain language, for use in the workshop as well as in the drawing office; giving full explanations of the construction of modern Steam Engines, including diagrams showing their actual operation; together with complete but simple explanations of the operations of various kinds of valves, valve motions, link motions, etc., thereby enabling the ordinary engineer to clearly understand the principles involved in their construction and use, and to plot out their movements upon the drawing board. By Joshua Rose, M. E., author of "The Complete Practical Machinist." Illustrated by 422 engravings. In one volume, quarto, 320 pages. *Price $6.00, free of postage to any address in the world.*

☞ *An illustrated circular 8 pages, 4to, giving the contents of this remarkable book, will be sent free to any one who will furnish his address.*

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS
810 Walnut Street, Philadelphia, Pa., U. S. A.

HASWELL'S
Engineers' Pocket-Book.
NEW EDITION,
Enlarged and Entirely Rewritten.
FROM NEW ELECTROTYPE PLATES.

Mechanics' and Engineers' Pocket-Book of Tables, Rules, and Formulas pertaining to Mechanics, Mathematics, and Physics, including Areas, Squares, Cubes, and Roots, &c., Logarithms, Steam and the Steam-Engine, Naval Architecture, Masonry, Steam Vessels, Mills, &c.; Limes, Mortars, Cements, &c.; Orthography of Technical Words and Terms, &c., &c. Forty-fifth Edition, Revised and Enlarged. By CHARLES H. HASWELL, Civil, Marine, and Mechanical Engineer, Member of American Society of Civil Engineers, Engineers' Club of Philadelphia, N. Y., Academy of Sciences, Institution of Naval Architects, England, &c. Pages xxx., 902. 12mo, Leather, Pocket-Book Form, . $4.00

Sent prepaid to any address on receipt of the price. Address

MUNN & CO., 361 Broadway, New York.

Our catalogue of books sent free to any address.

Address: The American Writing Machine Co., Hartford, Conn.; New York Office, 237 Broadway.

FOREIGN PATENTS.
Their Cost Reduced.

The expenses attending the procuring of patents in most foreign countries having been considerably reduced the obstacle of cost is no longer in the way of a large proportion of our inventors patenting their inventions abroad

CANADA.—The cost of a patent in Canada is even less than the cost of a United States patent, and the former includes the Provinces of Ontario, Quebec, New Brunswick, Nova Scotia, British Columbia, and Manitoba.

The number of our patentees who avail themselves of the cheap and easy method now offered for obtaining patents in Canada is very large, and is steadily increasing.

ENGLAND.—The new English law, which went into force on Jan. 1st, 1885, enables parties to secure patents in Great Britain on very moderate terms. A British patent includes England, Scotland, Wales, Ireland and the Channel Islands. Great Britain is the acknowledged financial and commercial center of the world, and her goods are sent to every quarter of the globe. A good invention is likely to realize as much for the patentee in England as his United States patent produces for him at home, and the small cost now renders it possible for almost every patentee in this country to secure a patent in Great Britain, where his rights are as well protected as in the United States.

OTHER COUNTRIES.—Patents are also obtained on very reasonable terms in France, Belgium, Germany, Austria, Russia, Italy, Spain (the latter includes Cuba and all the other Spanish Colonies), Brazil, British India, Australia, and the other British Colonies.

An experience of FORTY years has enabled the publishers of THE SCIENTIFIC AMERICAN to establish competent and trustworthy agencies in all the principal foreign countries, and it has always been their aim to have the business of their clients promptly and properly done and their interests faithfully guarded.

A pamphlet containing a synopsis of the patent laws of all countries, including the cost for each, and other information useful to persons contemplating the procuring of patents abroad, may be had on application to this office.

MUNN & CO., Editors and Proprietors of THE SCIENTIFIC AMERICAN, cordially invite all persons desiring any information relative to patents, or the registry of trade-marks, in this country or abroad, to call at their offices, 361 Broadway. Examination of inventions, consultation, and advice free. Inquiries by mail promptly answered.

Address, **MUNN & CO.,**
Publishers and Patent Solicitors,
361 Broadway, New York.

BRANCH OFFICES: No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

NEW YORK BELTING AND PACKING CO.
Oldest and Largest Manufacturers in the United States of

Vulcanized Rubber Fabrics
ADAPTED TO MECHANICAL PURPOSES.
RUBBER BELTING, PACKING, AND HOSE,
CORRUGATED
Mats and Matting, and Stair Treads, &c.
BICYCLE TIRES, CAR SPRINGS.

JOHN H. CHEEVER, Treas. JOHN D. CHEEVER, Dep'y Treas.
New York Belting and Packing Co.,
Warehouse, 15 Park Row, opp. Astor House, N. Y.
Branches: 308 Chestnut Street, Phila., 167 and 169 Lake Street, Chicago, and 52 and 54 Summer Street, Boston.

SANITARY EXAMINATION OF DRINKING Water.—By Prof. E. R. Angell. The odor of water and how to detect it. Tests and their applications. Nitrates and Nitrites. Lead and iron. Test for lead. Tests for organic matter. A valuable paper. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. **462.** Price 10 cents. To be had at this office and from all newsdealers.

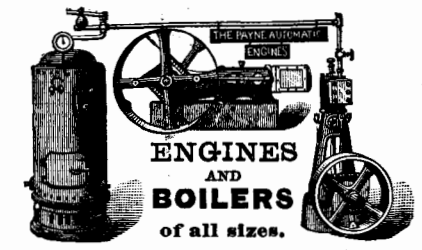
Mention this paper.

ADDRESS OF PROF. T. H. HUXLEY on resigning the Presidency of the Royal Society, Nov. 30, 1885, Results of the rapid progress of science. Influence on the moral, social and political relations of man. What should be done for the advancement of science. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **527.** Price 10 cents. To be had at this office and from all newsdealers.

The only Real Treatise on the Subject.
The Windmill as a Prime Mover.
Comprehending everything of value relating to Windmills, their Use, Design, Construction, etc. With many fine illustrations. By A. R. WOLFF, M.E., Consulting Engineer. 8vo, cloth, . . . $3.00
Mailed prepaid on the receipt of the price. Address
MUNN & CO., 361 Broadway, New York.

TESTS OF CEMENT.—REPORT OF the committee on a uniform test for cement. Cement tests. Fineness, checking or cracking. Tests recommended, mixing, etc., setting, sampling, sieves, moulds, machines, with 3 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. **526.** Price 10 cents. To be had at this office and from all newsdealers.

MODEL and EXPERIMENTAL WORK — A SPECIALTY.
Send for Circulars. **C. E. Jones & Bro.** CINCINNATI, O.
(Mention this Paper.)



ENGINES AND BOILERS of all sizes.

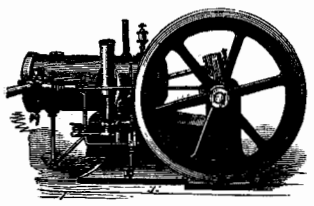
Write for Circular and tell us what you want.
B. W. PAYNE & SON, Drawer 1004, Elmira, N. Y.
New York Office: 107 Liberty Street.
Eastern Agents, HILL, CLARKE & CO., Boston, Mass.
Our patented Vertical Boiler will not prime. No danger of burning flues.

ACETYLENE.—CHEMICAL COMposition, Properties, mode of preparation, with 2 engravings of apparatus. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **496.** Price 10 cents. To be had at this office and from all newsdealers.

NOTICE to Users of Steam Pumps.
We have received following letter in regard to one of our No. 5 "L" ($16) Steam Jet Pumps elevating 1½ inch pipe of water more than 50 feet high:
"L'ANSE, MICH., Feb. 24, 1883.
"VAN DUZEN & TIFT, Cincinnati, O.:
"Money could not buy the Jet of us unless another could be had. I would not give your No. 5 "L" for a $700 pump, equal distance to raise.
"N. A. Litchfield, Supt. Mich. Slate Co."
We make Ten Sizes of these Pumps. Prices $7 to $75. Capacities 100 to 20,000 gallons per hour. State for what purpose wanted and send for Catalogue of "Pumps."
VAN DUZEN & TIFT, Cincinnati, O.

PETROLEUM AS FUEL IN LOCOMOtive Engines. A paper by Thomas Urquhart.—How locomotives are arranged for burning petroleum. The spray injector. Storage of petroleum. Experimental engines and tenders. Results of comparative trials. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. **455.** Price 10 cents. To be had at this office and all newsdealers.

ICE. REFRIGERATING
and Ventilating Machines
Jarmans Patent. **YORK MFG. CO., York, Pa.**



GAS ENGINES.
Best in principle, workmanship, and materials.
An unequaled small Motor adapted to all uses.
When the motor is not at work, the expense of running it ceases.
Simple, Safe, Economical, Durable. No extra insurance.
Four sizes: 1 H. P., ½ H. P., 1 man power, and Dental Engine.
These Engines are especially suited for Gasoline Gas for country use.
☞ *Send for Illustrated Catalogue.*
ECONOMIC MOTOR CO.,
Office and Salesrooms, 9 CORTLANDT ST., NEW YORK.

HOISTING ENGINES
and Boilers for every possible duty.
New catalogue ready.
LIDGERWOOD MANUFACTURING CO., 96 LIBERTY STREET, NEW YORK.

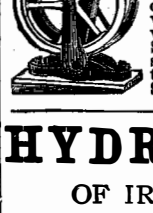
OUTFITS and INSTRUCTIONS for
MAKING RUBBER STAMPS.
S. A. BROWN, Buffalo, N. Y.

COPPER WIRE; HOW DRAWN.—AN interesting description of the process of drawing copper wire as practiced at the celebrated works of Mouchel, at Aube, Boisthorel, and Tillieres, France. Illustrated with 5 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **471.** Price 10 cents. To be had at this office and from all newsdealers.

CONSTRUCTION OF STABLES. — A paper by A. W. Wright, describing a model stable just finished for the North Chicago City Railway. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. **463.** Price 10 cents. To be had at this office and from all newsdealers.

Mineral Lands Prospected
Artesian Wells Bored. Superior Stationary Engines, specially adapted to Electric Light purposes. Built by P.A. DIAMOND DRILL CO., Birdsboro, Pa.

THERAPEUTICAL EFFECT OF THE Internal Administration of Hot Water in the Treatment of Nervous Diseases.—By Ambrose L. Ranney, M.D. Rules for administration. The effects of the treatment. Theory of the action of hot water. Points in its favor. Conclusions. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **463.** Price 10 cents. To be had at this office and from all newsdealers.



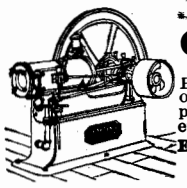
IMPORTANT!
You can get a steam pump, that, with a 3 in. steam cylinder and 60 lbs. steam, will deliver from a 3¼ air cylinder, air or gas, as against 165 lb. cool and dry, for only $100. Same with 6 in. cylinder for vacuum (140 gals. per min.), $85. Ditto with 8 in. air cylinder for blowing, $90. Send letter (no postal) with 5 two cent stamps for large photo. and description to **H. Weindel, 405 N. 4th St., Philadelphia.**

POLISHING FELTS.
ALFRED DOLGE,
MANUFACTURER,
122 East 13th Street, NEW YORK.

PRESERVATION OF TIMBER.—REport of the Committee of the American Society of Civil Engineers on the preservation of timber. Presented June 25, 1885. Preserving processes, kyanizing, and results, burnettizing, creosoting, boucherie, decay of timber. Selection of preserving process, modes of application. Will it pay? Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **512, 513, 514,** and **517.** Price 10 cents each, or 40 cents for the series. To be had at this office and from all newsdealers.

PULLEYS.
Order from our "Special List."
THE JOHN T. NOYE MFG CO.,
BUFFALO, N. Y.

MICRO-ORGANISMS OF POTABLE Waters.—A paper by Dr. T. Leone, showing that atmospheric oxygen is not an element necessary for the increase of microbia in potable waters, and that the carbonic acid is the sole agent that interferes with the life of these organisms in carbonic acid waters. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **524.** Price 10 cents. To be had at this office and from all newsdealers.



CHARTER'S
GAS ENGINE.
Warranted equal to any in Power and Economy, and Superior to all in Simplicity and Compactness. Gives an Impulse at every Revolution.
Engines and Pumps Combined.
Williams & Orton Mfg. Co.,
P. O. Box 148. STERLING, ILLS.

The New Catalogue of Valuable Papers
contained in SCIENTIFIC AMERICAN SUPPLEMENT, sent *free of charge* to any address.
MUNN & CO., 361 Broadway, N Y.

HYDRAULIC FLANGED HEADS,
OF IRON OR STEEL, FOR BOILER AND TANK MAKERS.
Unequaled for Strength and Uniformity.
THE DICKSON MANUFACTURING CO.
SCRANTON, PA.
96 Lake Street, Chicago, 57 Oliver Street, Boston, 112 Liberty Street, New York.

NOVELTY ELECTRIC CO.
Importers, Manufacturers and Dealers in Electrical Goods of Every Description.
Factory and Store, 5th and Locust Sts., Philadelphia.

FUEL OF THE FUTURE.—BY George Wardman. Historical notes on natural gas. Duration of the supply of natural gas. The economic question connected with its use. Its advantages as a fuel. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **497.** Price 10 cents. To be had at this office and from all newsdealers.

WORKSHOP RECEIPTS.
For the use of Manufacturers, Mechanics, and Scientific Amateurs. The best late collection published of such a wide variety of information.

FIRST SERIES.—Bookbinding; Candles; Drawing; Electro-Metallurgy; Engraving; Gilding; Japans; Photography; Pottery; Varnishing, etc. 450 pages, with illustrations, ... **$2.00**

SECOND SERIES.—Industrial Chemistry; Cements and Lutes; Confectionery, Essences, and Extracts; Dyeing, Staining, and Coloring; Gelatine, Glue, and Size; Inks; Paper and Paper Making; Pigments, Paint, and Painting, etc., ... **$2.00**

THIRD SERIES.—Alloys, Electrics, Enamels and Glazes, Glass, Gold, Iron, and Steel, Lacquers and Lacquering, Lead, Lubricants, Mercury, Nickel, Silver, Tin, Vanadium, Zinc, etc. 480 pages. 183 illustrations, . **$2.00**

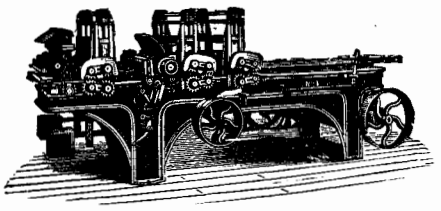
FOURTH SERIES.—Waterproofing; Packing and Storing; Embalming and Preserving; Leather Polishes; Cooling Air and Water; Pumps and Siphons; Desiccating; Distilling; Emulsifying; Evaporating; Filtering; Percolating and Macerating; Electrotyping; Stereotyping; Bookbinding; Straw-plaiting; Musical Instruments; Clock and Watch Mending; Photography, etc. **$2.00**

☞ Send for our complete Catalogue of books, free to any address.

☞ In ordering single volumes, be particular to mention the "series" wanted.

Sent postpaid by **MUNN & CO., 361 Broadway, New York,** on receipt of price.

BRIDGE ACROSS THE MISSISSIPPI AT Prairie du Chien.—By John Lawler, C.E. A paper read at the Annual Meeting of the American Society of Civil Engineers, and discussion following. With five engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT. No. **463.** Price 10 cents. To be had at this office and from all newsdealers.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

SINKING THROUGH QUICKSAND. —A paper by H. W. Hughes, describing the Poetsch process of sinking through quicksand by means of artificial freezing. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **468.** Price 10 cents. To be had at this office and from all newsdealers.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS
THOMAS DEVLIN & CO. FINE TINNING, JAPANNING AND FINISHING
LEHIGH AVE. & AMERICAN ST. PHILA.

ESSENTIAL ELEMENTS OF PLANTS. —A paper by Thos. Jamieson, discussing the question whether the reduction in the number of the chemical essentials of plants has reached its final limit, and presenting experiments to show that a further reduction seems demanded. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **524.** Price 10 cents. To be had at this office and from all newsdealers.

FREE TRIAL.—NERVITA speedily cures all effects of youthful errors. Nervous Debility, Involuntary Losses, Lost Manhood, and kindred affections. 12 cents postage. Free at office. **TRIAL** package Dr. A. G. OLIN CO., 180 E. Washington St., Chicago.

DYKE'S BEARD ELIXIR Forces luxuriant Mustache, Whiskers, or hair on bald heads in 20 to 30 days. Extra Strength, Quick, Safe, Sure. No other remedy. 3 or 3 Pkgs. does the work. Will prove it or forfeit $100.00. Price per Pkg. with directions sealed and postpaid 25 cts. 3 for 50 cts. stamps or silver. Smith Mfg. Co., Palatine, Ills.

DON'T SUFFER WITH DYSPEPSIA,
Another day, but send for my remedy. It is a specific; Cures successfully, permanently, and only costs 25 cents. Address JNO. H. McALVIN, Lowell, Mass.

FITS Cure Guaranteed! Dr. Sinclair's old English Specific is a positive cure for epilepsy, fits, &c. Pleasant to use; prompt and effective; contains no bromide. Send for circular. E. S. PECK, 16 Murray St., New York.

WEAK MEN!
Whose **VITALITY** is failing, Brain **DRAINED** and **EXHAUSTED** or Power **PREMATURELY WASTED** may find a perfect and reliable cure in the
FRENCH HOSPITAL REMEDIES
originated by Prof. JEAN CIVIALE, of Paris, France. Adopted by all French Physicians and being rapidly and successfully introduced here. All weakening losses and drains promptly checked. **TREATISE** giving newspaper and medical endorsements, c., **FREE.** Consultation (office or by mail) with six eminent doctors **FREE.**
CIVIALE AGENCY, No. 174 Fulton Street, New York

CURE FOR THE DEAF
PECK'S PATENT IMPROVED CUSHIONED EAR DRUMS Perfectly Restore the Hearing, and perform the work of the natural drum. Invisible, comfortable and always in position. All conversation and even whispers heard distinctly. Send for illustrated book with testimonials, FREE. Address or call on F. HISCOX, **853** Broadway, New York. Mention this paper.

NO MORE CATARRH. The Great German Remedy is a positive cure. Free sample package and book for 4 *cents* in stamps. E. H. MEDICAL CO., East Hampton, Conn.

PILES. Instant relief. Final cure in 10 days, and never returns. No purge, no salve, no suppository. Sufferers will learn of a simple remedy, Free, by addressing C. J. MASON, 78 Nassau St., N. Y.

TO WEAK MEN suffering from the effects of youthful errors, early decay, lost manhood, etc. I will send a valuable treatise (sealed) containing full particulars for home cure, free of charge. Address Prof. F. C. FOWLER, Moodus, Conn.

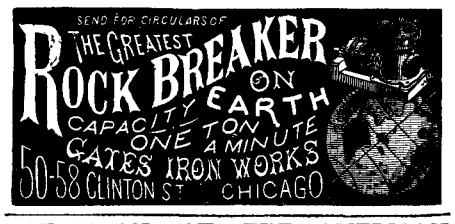
WEAK, UNDEVELOPED PARTS
Of the body enlarged and strengthened. Simple, unfailing self-treatment. Full explanation, references, &c., sent sealed free. ERIE MEDICAL CO., BUFFALO, N. Y.

© 1886 SCIENTIFIC AMERICAN, INC

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.



EDUCATION OF THE AMERICAN Citizen.—A lecture by Prof. R. H. Thurston on the theme: "How may we best aid in those mighty social movements and those tremendous political changes which mark the mighty progress of the race toward a better and a more prosperous future?" Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **524**. Price 10 cents. To be had at this office and from all newsdealers.

Perfect Small Steam Yachts. No smoke or noise, simple, safe; fuel, water gas; 3 cylinder engines. Send stamp for either yacht or boat catalogue.
THOMAS KANE & CO., Racine, Wis., Chicago, Ill.

PRESERVATION OF BUILDING MAterials by the Application of a Paraffin Wax compound, as recently used upon the Egyptian Obelisk, Central Park, N. Y. By R. M. Caffal. With one engraving. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **526**. Price 10 cents. To be had at this office and from all newsdealers.

To Business Men.

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN, when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done, for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

For rates see top of first column of this page, or address

MUNN & CO., Publishers,
361 Broadway, New York.

H. W. JOHNS
ASBESTOS ROOFING

FIRE AND WATER-PROOF BUILDING FELT, FIRE-PROOF PAINTS, STEAM PACKINGS, BOILER COVERINGS, ETC.

Samples and descriptive Price List free by mail.
H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.
CHICAGO. PHILADELPHIA. LONDON.

MODERN BRONZE ALLOYS.—A PAper by P. F. Nursey, C.E., presenting some valuable data concerning such bronzes as are being usefully employed for engineering purposes. The bronze of the ancients. Composition of bronzes. Phosphor bronze and its applications. Silicium bronze. Manganese bronze. Delta metal. Phosphor-copper. Phosphor-manganese bronze. Phosphor-lead bronze. Phosphor-tin. Aluminum bronze. Silveroid. Cobalt bronze. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **465**. Price 10 cents. To be had at this office and from all newsdealers.

THE CHEAPEST AND BEST
PHOTO ENGRAVING CO.
67 PARK PLACE, NEW YORK
ENGRAVING FOR ALL ILLUSTRATIVE AND ADVERTISING PURPOSES

WM. A. HARRIS,
Providence, R. I. (Park St.) Six minutes' walk West from station.
Original and Only Builder of the
HARRIS-CORLISS ENGINE,
With Harris' Pat. Improvements, from 10 to 1,000 H. P
Send for copy Engineer's and Steam User's Manual. By J. W. Hill, M.E. Price $1.25.
MENTION THIS PAPER.

PATENTS.

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *forty one years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.

MUNN & CO., Solicitors of Patents,
361 Broadway, New York.

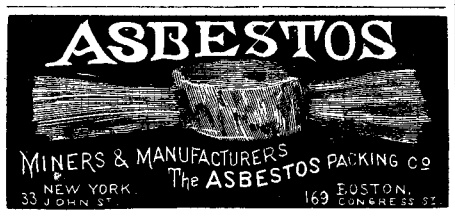
BRANCH OFFICES.—No. 622 and 624 F Street, Pacific Building, near 7th Street, Washington, D. C.

Use the JENKINS STANDARD PACKING in the worst joint you have, and if, after following directions, it is not what we claim, WE WILL REFUND THE MONEY.

Our "Trade Mark" is stamped on every sheet. None genuine unless so stamped. ☞ Send for Price List.

JENKINS BROS.,
71 John Street, N. Y. 79 Kilby Street, Boston.
13 So. Fourth Street, Phila.

VENTILATION.—GREAT IMPORTance of ventilation. The vitiation of air that is constantly going on in inhabited places, exhaustion of oxygen by gas, candles and lamps. Ventilation by natural and artificial means. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **525**. Price 10 cents. To be had at this office and from all newsdealers.



SAWS Wanted 50,000 Sawyers and Lumbermen to send us their full address for a copy of Emerson's ☞ Book of SAWS. We are first to introduce NATURAL GAS for heating and tempering Saws with wonderful effect upon improving their quality and toughness, enabling us to reduce prices. Address
EMERSON, SMITH & CO. (Ltd.), Beaver Falls, Pa.

SHOEING HORSES.—ABSTRACT OF A paper by Secretary Russell, of the Massachusetts State Board of Agriculture, giving some valuable hints on the proper method of shoeing horses. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **461**. Price 10 cents. To be had at this office and from all newsdealers.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

DRAINAGE.—A SERIES OF VERY excellent directions for draining railways, roads, etc., by Mr. Charles Paine. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **468**. Price 10 cents. To be had at this office and from all newsdealers.

EPPS'S

GRATEFUL—COMFORTING.

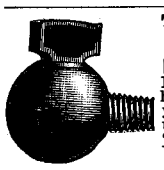
COCOA

THE WALL.—A LECTURE BY PROF. T. R. Smith, F.R.I.B.A. Physical Qualities and Mode o Constructing. Walls of the Middle Ages. Egyptian, Grecian, and Roman Walls. Different ways of dealing with a Wall. Masonry of the Jews. Ornamentation. Color. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **466**. Price 10 cents. To be had at this office and from all newsdealers.

STEWART'S PATENT READY ROOFING

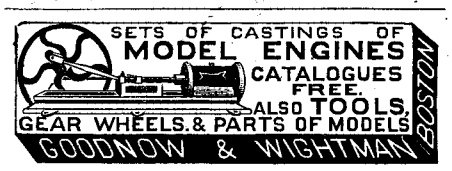
For ROOFS OF ALL DESCRIPTIONS, steep or flat, can be applied by ordinary workmen having no previous experience. Send for Samples and Illustrated Pamphlet. Address
W. H. STEWART,
74 Cortlandt Street, New York.
IRON-FIBRE PAINT, for Roofs and Factory and Farm Buildings.

AERIAL NAVIGATION.—DESCRIPtion and illustration of a new aeronautic machine, devised by Mr. Fred. W. Brearey, Secretary of the Aeronautical Society of Great Britain. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **467**. Price 10 cents. To be had at this office and from all newsdealers



The most successful Lubricator for Loose Pulleys in use.
VAN DUZEN'S PATENT LOOSE PULLEY OILER.
Highly recommended by those who have used them for the past two years. Prices very reasonable. Every user of machinery should have our "Catalogue No. 55;" sent free.
VAN DUZEN & TIFT, Cincinnati O.

CHOLERA.—ABSTRACT OF A PAPER by Dr. F. H. Hamilton, presenting the various facts that are absolutely known about Asiatic cholera. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **471**. Price 10 cents. To be had at this office and from all newsdealers.

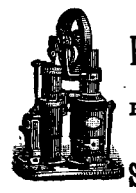


ON SEWAGE DISPOSAL—BY PROF. H. Robinson. Sewage disposal on land. Sewage disposal by chemical treatment. Sewage disposal by discharge into river or sea. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **467**. Price 10 cents. To be had at this office and from all newsdealers.

RESERVOIRS.

The only absolutely water-tight reservoirs for town, and cities; also acid-proof reservoirs. For description send to T. NEW, 32 John Street, New York.

EVOLUTION; THE LATEST ADvances of the Doctrine of Evolution. By E. C. Cope and W. H. Ballou.—Present status of the theory. Mr. Darwin's views. Beginnings of structures and origin of them, adaptation of means to ends. Every day phenomena. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **527**. Price 10 cents. To be had at this office and from all newsdealers.



THE IMPROVED
Rider Hot Air Pumping Engine
For City or Country Residences,
Burns Coal, Wood, or Gas. Safe, Simple Durable. **3,000** in use. Send for Illustrated Catalogue "A."
SAYER & CO., 37 Dey St, New York.

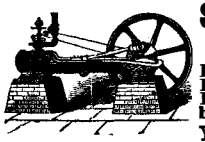
MACHINERY AND EDUCATION.—A lecture by Dr. R. W. Raymond, pointing out some interesting analogies between the evolution illustrated in the growth of natural forms in the visible world and the development and adaptation of the human mind and thought, as modified by environment and education. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **525**. Price 10 cents. To be had at this office and from all newsdealers.

HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.
HARTFORD. CONN.

ELECTRIC CONVEYORS.—DESCRIPtion of two ingenious systems for the electric carriage of small packages. Illustrated with 13 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **464**. Price 10 cents. To be had at this office and from all newsdealers.

LIGHTNING RODS.—DESCRIPTION OF of the arrangement adopted by Mr. Melsens for protecting the Brussels Hotel de Ville against lightning. With 6 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **525** Price 10 cents. To be had at this office and from all newsdealers.

MICROSCOPES *Telescopes, Spectacles, Barometers, Thermometers, Photographic Outfits for Amateurs, Opera Glasses, &c.* **W. H. WALMSLEY & CO.** successors to R. & J. Beck, Philadelphia. Illus. Price List free to any address.

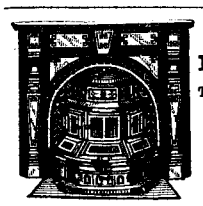


STEAM ENGINES.
Horizontal and Vertical.
Dredging Machinery, Flour, Powder, Slate and Flint Mill Machinery, Turbine Water Wheels.
York Mfg Co., York, Pa. U. S. A.

THE MANUFACTURE OF CRUCIBLE Cast Steel.—A paper read before the Steel and Iron Institute by Henry Seebohm. A presentation of the facts connected with the old-fashioned method of converting bar iron into steel and then melting it in clay pots to form ingots of cast steel. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **464**. Price 10 cents. To be had at this office and from all newsdealers.

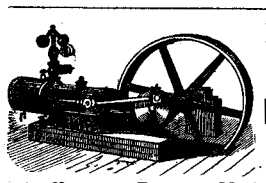
Barnes' Pat. Foot & Hand Power MACHINERY, $15.
Contractors and Builders, Cabinet Makers and Jobbers in Wood or Metal, who have no steam power, can, by using outfits of these machines, bid lower and save more money than by any other means for doing their work. Sold on trial. Illustrated Catalogue FREE.
W. F. & JOHN BARNES CO.,
Address 1999 Ruby St., Rockford, Ill.

CORRESPONDENCE BY MEANS OF Pigeons.—Intelligence of pigeons, breeds preferred arrangement of cotes, organization of cotes, food coupling, rearing and training, velocity, with 7 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. **522** and **526**. Price 10 cents each. To be had at this office and from all newsdealers.



Bibb's Celebrated Original BALTIMORE FIRE-PLACE HEATERS,
To warm upper and lower rooms. The handsomest, most economical Coal Stoves in the world.
B. C. BIBB & SON
Foundry Office and Salesrooms, 39 and 41 Light Street, Baltimore, Md.
MARBLEIZED SLATE MANTELS.
☞ *Send for Circulars.*

THE CONVERSION OF HEAT INTO useful work.—A series of interesting lectures by Wm. Anderson, M. Inst. C.E., presenting the modern views connected with the conversion of heat into useful work. I. Laws of motion, the principles of work and energy, and the laws of impact. II. Theories of oscillation and vibration. III. Properties of gases and vapors. IV. Transfer of the invisible molecular motion of heat, and its change into the coarser and apparent motion of mechanical work. V. How the waste of heat in furnaces is prevented by the Siemens regenerator. The principle further illustrated. Cowper stoves. The gun as a converter of heat. VI. Heat engines proper. Illustrated with 58 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENTS, Nos. **498, 499, 500, 501, 502, 503**. Price 10 cents each, or 60 cents for the series. To be had at this office and from all newsdealers.



LOVEGROVE & CO.
PHILADELPHIA, PA.
Builders of
ENGINES AND BOILERS.
4 to 60 Horse Power. Most reliable engine made. Reasonable prices.

THE AMERICAN BELL TELEPHONE CO.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

STEAM CATAMARAN MAY BARrett.—Plans and specificationn of the catamaran May Barret], a family cruising boat built for use on rivers and lakes. Construction of hulls, deck beams, main deck, upper works, engine and boiler, wheel. With 10 figures. Cotanined in SCIENTIFIC AMERICAN SUPPLEMENT, No. **472**. Price 10 cents. To be had at this office and from all newsdealers.

DRAWING INSTRUMENTS. Illustrated catalogue sent on application to WM. T. COMSTOCK, 6 Astor Place, New York.

OF THE
Scientific American
FOR 1886.
The Most Popular Scientific Paper in the World.

Only $3.20 a Year, including Postage. Weekly 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; **six months, $1.60; three** months, $1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
361 Broadway New York.

THE
Scientific American Supplement.

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy, Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information pertaining to these and allied subjects is given, the whole profusely illustrated with engravings.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are represented and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year, or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Address and remit by postal order, express money order, or check,

MUNN & Co., 361 Broadway, N. Y.,
Publishers SCIENTIFIC AMERICAN.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal or express money order, or draft to order of

MUNN & CO., 361 Broadway, New York.

PRINTING INKS.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Phila., and 47 Rose St., opp. Duane St., N. Y.

© 1886 SCIENTIFIC AMERICAN, INC